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BRIEFLY TOLD.

OUR SEMI-ANNUAL INQUISITION.—As was said by us last midsummer, our practice in respect to collecting statistics, from what might be considered test points throughout the country, showing the growth of the gas business, has been so modified that the figures obtained shall relate to each even half year—the six months, ending with the last day of December and June, respectively. New mention of this is made from the fact that our circulars for last half will be mailed on or before January fifth, and we ask for fairly prompt responses. There can be no gainsaying that these semi-annual statements are of interest and of value to the gas makers, in that they are the result of actual working, close to the time. So that they may be all the more interesting it is necessary that they be comprehensive, hence we give expression to the hope that no one who receives a circular will fail to forward a reply. We, of course, guarantee our correspondents that their figures will not be revealed to anyone save those whose duty it will be to prepare them for publication.

ANNUAL MEETING, SOCIETY OF GAS LIGHTING.—The annual meeting of the Society of Gas Lighting, which was held in this city on the afternoon of the 17th inst., was as usual a most entertaining and enjoyable gathering. A large attendance is reported and the dinner was demolished after the fashion of those who lead regular lives. The annual reports of the officers show that the Society moves onward and upward. The officers chosen to serve in 1892 are:

President—Jos. R. Thomas.
Vice-President—Eugene Vanderpool.
Treasurer—William Combe.
Secretary—Fred. S. Benson.
Member Executive Committee—F. C. Sherman.

The Standing Committees are:

Finance Committee—C. H. Nettleton, A. B. Slater and H. F. Allen.
Committee on Papers—F. C. Sherman, A. B. Slater and H. B. Leach.
Committee on Place of Meeting—D. D. Flemming, A. H. Strecker and H. F. Allen.

DEATH OF MR. J. U. CORBETT.—Death is always harsh and grim, but how especially hideous does it seem when the summons is served in the joyous Christmas time. Such has been the sad experience of Mr. Charles H. Corbett, of the Continental Iron Works, whose third son, Jeronemus U. Corbett, died at Portland, Oregon, on the 16th inst., after an illness of fever that was first developed on Thanksgiving Day. Deceased, who was in his 22d year, was an odd mark for fever to seize and destroy, in that he was of heroic build—in fact a veritable athlete. He had served for a year under Mr. C. D. Lamson, at the Worcester (Mass.) gas works, and afterwards was in the draughting room of the Continental Iron Works. Thus although pretty well versed in the gas business he preferred to try his fortune in the West. In 1890 he visited the Pacific Coast, finally selecting Portland, Oregon, as the place that offered the greatest promise. He returned home to prepare for his residence abroad. On the journey out, while at Vancouver, B. C., he had

the misfortune to throw his knee out of joint, the disability lasting for five weeks. About September first, Mr. Corbett, Senior, paid him a visit, and together they spent three delightful weeks in travel over the Puget Sound district. This outing—the father and son were more like school chums than parent and child—was the prelude to his settling down to business, a suitable opening for which was found by him in Portland. Everything promised happiness and success, but death intervened. He was a bright, lovable youth, and the sympathy of the fraternity will go out in unstinted measure to his afflicted parents.

SPECIAL WESTERN CORRESPONDENCE.

By Sunset.

Dear Journal:

The World's Fair Committee have come and gone, and no topic is more discussed among us than their work, and the whole matter. To here go into detail of their work I shall not, having no desire to trespass in their province; but, generally speaking, I can say that satisfaction is felt at the preliminary work of the Committee.

They went to Chicago and promptly; and, while there, their efforts with the Fair management were unremitting. A *little* headway was made. Matters, and the prospects, even though adverse, were outlined as they had not been before. The complete domination of the electrical interests was clearly found, and the obstacles to be contended with. A line of conference, proposition and action was more or less fully gone through, and the Committee left with a realization of the magnitude of the work before them, but tempered by the fact that some knowledge which they secured was at least some power.

Considerable apprehension was felt in this section that the indefatigable efforts of Col. Barrows, of Philadelphia, to secure representation on behalf of "The Gas Appliance Exchange," would clash with the efforts of the General Committee, and much pleasure was had when it was learned that the enterprising Colonel had been added to the Committee and the forces united.

If the gas interests ever needed union to accomplish an object, it is in the present instance.

Mark this Western caution: It will be all the gas interests can do to get adequate—if that—representation in any event, and divided efforts will be fatal.

United work is the only thing that will "get there."

Col. Barrows' scheme of striking at the root of the matter at Washington is generally thought a good one. Chicago wants that loan of $5,000,000 above all other things, either temporal or eternal, and determined opposition to it at Washington, unless pledged adequate showing and facilities for gas interests at the Exposition, will strike in the most tender spot.

Mark another thing in this matter: The Chicago Gas Companies have been charged with a lack of interest, and coldness. Consideration of the matter has been given by them to an extent unknown to the outside gas interests, and you may put it down as correct that what they can do, they will do, when called upon, when allowed to, or when the time comes.

Barring the World's Fair matter, I know of nothing more generally touched upon of late in Western gas circles than the departure of Mr. Fred R. Persons from Chicago. I am told that those around his old stamping ground are suffused with tears, that are but partly assuaged by the fact of his advance in a business sense. Such a universal expression of regret is indeed a tribute that he may well be proud of. Every one, though, is sincerely glad of Mr. Person's advancement, and all wish him the utmost success in his new field. What we now want to know is, however, "What will the Gas Club of Chicago do without the active work of its departing officer, and who, in the future, will turn to and get up special car parties and expeditions of Western men, as he has been yielded the palm for ability in doing of yore?"

One man lately observed that the Standard Oil Company will not be so allegedly unpopular long if it takes in many Fred. Persons.

I hear that Mr. Gribbel's brother is spoken of as Mr. Persons' successor. Also that a meter house not now represented in Chicago will shortly open a Western branch there.

By the way, what a great number of changes there have been in the past year, and less, among the well known Western gas men. Mr. McMillin going from St. Louis; Col. Stedman to that place; Mr. Chollar from Topeka, there; Mr. Egner to New York, and now out again (at which, by the way, I hear great regret expressed); Mr. Brown following him, and also out; Mr. Wilkiemeyer to Evansville; Mr. Gimper to Galveston; Mr. Lynn to Memphis; Mr. Geo. T. Thompson to "Station B," St. Louis; Mr. Howard, from Dubuque to (?); Mr. Douglas to Minneapolis.

Truly, there seems to have been an unusual upheaval. Most of the changes, one is glad to note, however, have been onward and upward, and for the better.

Apropos of Mr. Howard, yclept "Uncle Jerry," I hope soon to hear of the satisfactory closing of active nogotiations which will again install him at the helm. A snug little property, of which he shall be king, nestled in the valley of the Mississippi, which he knows and likes so well (even in a stone's throw of his old camping ground), in a town replete with martial memories of the Rebellion's greatest general, is the tempting allurement. Whether that deal is consummated or not, all hope that Mr. Howard will soon find a satisfactory place in which to resume work; for idle, he is not himself.

And apropos of Douglas. None of the Western men who were fortunate enough to get to the American meeting, last year, in Savannah—in many respects the most enjoyable that that Association has yet had—need be introduced to Mr. David Douglas, Manager of the local Company, whose energy and geniality was so largely responsible for its success—certainly of the entertainment portion. From the cotton fields of the Sunny South to the ice palaces of the Northwest is a contrast indeed, but I opine that the climatic differences of Minneapolis will make no difference in *him*. Mr. Douglas is an accession to the West, and, in taking charge of the practical end at Minneapolis, he will be welcomed by all hereabouts. 'Tis not so many years ago, if memory fails me not, when but the little town of Sarnia, Ont., was under his care. The contrast of then and now must be a gratifying one to him.

One of the genuine surprises with us lately is that the Hon. J. N. Huston, of Connersville, Ind., should, according to pretty general rumor, have taken hold of the latest "patent process" to appear. Mr. Huston was for awhile U. S. Treasurer, and is generally credited with being an astute politician and a keen business man. From one who knows him, however, I learn that he is a little given to undue enthusiasm over his latest fancy—whether it be politics, banks, blooded horses or marble quarries—which are but a few of his interests in the Hoosier State. The chances are not unlikely that, not having any special knowledge of the gas business, the glamor of the claims of a new process has for the nonce overshadowed his deeper judgment. Certainly this is to be hoped, rather than that, knowing what it is, he may be expecting with it to "work" the public by reason of his busines ability. The process is outlined in your issue of December 7th, and is hardly one that a keen business man would, so suddenly, legitimately take up unless through a positive lack of knowledge concerning it. In effect it is but a new form of the well known superheater water gas system, and not a particularly good form at that. A generator with sundry devices in front, a fixing chamber in the rear, of truly wondrous design; a snake with fire brick balls in its stomach! is what first comes to one's mind on beholding it. A plant, said to be in operation in one of the Southern States, will soon show if there is much worth to the machine. The contrary, I predict. Another plant is planned for in Indianapolis, to utilize some old natural gas mains. Already claims of "5 cts. per M." and "better than natural gas" are made, the same old earmarks that are a pretty good—or a pretty bad—sign of the worth (or lack of it) and class of such processes or their promoters. I sincerely trust Mr. Huston may not get very deep into this latest creation of the process-monger's brain.

The Market for Gas Securities.

The city market for gas shares was, in common with the general share list, strong and higher during the week, the opening price to-day (Thursday) for Consolidated having been made at 99⅛ to 99⅝—a gain of three points during the week. Equitable also improved, and perhaps the gain in it might be attributed to the arrangement said to be consummated between the Company and the Standard Company, under which the latter agrees to take 1,000,000 cubic feet of gas per day from the Equitable. How long the contract is to remain in force we are unable to say.

Over in Brooklyn the situation is unchanged, the feature being the rise in Citizens shares, which are quoted to-day at 91¼ to 91½. Old Brooklyn maintains its advance, and Nassau is in demand at an advance of 3 points over our last quotation. Chicago gas is fairly booming and is now at 69, the highest figures reached in it for many a day. We are of the opinion that this stock is pretty near high water mark for the present, but would not advise any short sales of it, unless the seller has the certificates in his strong box. Washington (D. C.) gas is being inquired after, and a better feeling seems to exist in Bay State securities.

A Discussion on "Differential Rates."

The JOURNAL for September 21, 1891 (p. 399), contained a paper, read by Mr. Thomas Newbigging at the midsummer meeting of the Manchester District Institution of Gas Engineers, on the subject of "Differential Rates." As is the custom at this Association, the topics presented through the medium of the papers are not always discussed at the meeting before which they are read, the discussions being postponed until the time set for the next convention, which usually is held quarterly. The regular quarterly meeting following the August gathering was held at Manchester, on the last Saturday in November, and after the transaction of some routine business the Chairman (Mr. T. O. Paterson, of Birkenhead) called up the paper by Mr. Newbigging for discussion. The following summary of the paper and debate (reprinted from the *Gas World*) will be of interest to our readers:

Mr. Newbigging argued that it was fair and reasonable for a municipal gas undertaking to charge a higher price for gas supplied outside its municipal boundaries than is charged inside; first, because in the outside districts the consumption per mile of main is less, and consequently the cost of distribution greater; secondly, because the ratepayers of the town have to bear the risk contingent on the undertaking as a mercantile concern. He admitted that there is no real risk in the possession of a gas works managed with care and diligence, but prudent administrators will assume there is and take it into account. Referring to the contention that where there is only one authorized maximum price, the charge should be uniform over the whole area, he said it did recommend itself as conclusive, for it was tantamount to saying that the owner of the undertaking should be compelled to supply gas at a loss. In particular cases a give and take policy was advisable, and circumstances might render a uniform charge desirable; but at the same time the fact that it was the juxtaposition of the sparsely populated district to the town that enabled the former to obtain gas at a reasonable price ought not to be ignored. He was opposed to local authorities making large profits to go in reduction of rates, but at the same time it would be grossly unfair to recognize the claim of the outside consumers to have their legitimate gas charges reduced at the expense of the consumers within the limits of a densely populated town.

Mr. Isaac Carr, Widnes, who opened the discussion, said there were few but would agree that local authorities possessing gas works were quite justified in charging a higher price for the gas sold outside the town in which the works were situated. Of course, as the author of the paper had pointed out, it had been argued that there was no real risk connected with the ownership of gas works, and that on the ground of risk the authorities were not entitled to make any extra charge; but be that as it might, there was no gainsaying the fact of the extra cost of distributing the gas in distant and straggling districts. The cost was necessarily much greater than it was in towns where the streets were all built up. In addition to the extra cost of distribution, there was the cost of maintenance. For instance, they had at Widnes an outlying village, some four miles outside the boundary. Well, the cost of maintenance there was almost double what it was in the town, on account of the time taken up in going to and from, and the cost of the transit of materials. The same remark applied to the cost of index taking and of collecting the accounts. It would be interesting to know what was the practice that obtained with gas companies, which were in exactly the same position as local authorities in respect to the supply of gas to consumers at a distance, with the exception that the ratepayers had no liability in connection with the works. The author referred to Oldham as an exception to the rule in favor of the charging of a differential rate. He did not know why this should be so, for he considered that gas works should be treated just like other mercantile concerns, although they were owned by a town. If it was inconvenient to erect the works inside the borough, and they were erected outside, the owners were obliged to discharge their liability to the rates of the district in which the works were erected, and if that liability was discharged, he failed to see the justice of putting another tax upon them by refusing to allow an extra price to be charged. At Widnes they had works outside the boundaries, but if the people of that district demanded to be supplied with gas at the same rate as the people within the borough, he thought they would be at a loss to find any reasonable argument in support of their application.

Mr. C. A. Craven, Dewsbury, who was next invited to speak, said that in the borough with which he was connected they did not charge a differential rate, although 20 per cent. of their consumption lay entirely outside the corporation limits. On the other hand, in the adjoining borough of Batley, 5d. per 1,000 cubic feet more was charged to the consumers in the out-districts. Comparing the towns, he must say he preferred the practice followed in Dewsbury, because they hoped that some day these districts, seeing the advantages they had to offer, might be induced to come in. They were a little coy at present, but when they saw that the borough of Dewsbury treated them fairly and liberally, as compared with some of their neighbors, they would ultimately come round and want to join the borough.

Mr. W. W. Hutchinson, Barnsley, said he must confess to some measure of disappointment with Mr. Newbigging's paper. The paper was entitled "Differential Rates," and he had hoped the author would have treated of the different kinds of rates which came under that head, instead of dealing only with one branch of the subject. One point on which Mr. Newbigging's experience and researches would have been useful was that of the wisdom of differentiating the price according to the quantity consumed. As to this the practice varied very much. At Barnsley they had a sliding scale according to consumption. Then, again, he could have wished to hear something from Mr. Newbigging about the benefit of giving people the advantage of a differential rate in the summer time. Owners of gas undertakings suffered through having their large capital very fully employed in the winter time, but not so much in the summer, and what was wanted was some means of getting an all-round consumption, to keep their capital better employed, and enable them to reduce the whole rate very much. He could quite see that in some cases to reduce the price in the June and September quarters would add very much to the success of the undertaking. Then there was the question of the wisdom of charging a differential rate for gas supplied to gas engines, cookers and the like. Of course, as they knew, that practice was followed in many towns, and he would have liked to hear Mr. Newbigging's opinion as to the wisdom or unwisdom of it.

Mr. T. Duxbury, Darwen, said he was somewhat at a disadvantage in taking part in a discussion on this question, as he had no out-townships whatever to deal with, but only one township, throughout which the same price was charged. He happened, however, a few years ago, as Mr. Newbigging knew, to be in the position of wanting to buy gas from a neighboring gas works, from Blackburn, and it would seem to go somewhat against the opinions of Mr. Newbigging as to the terms on which gas should be supplied to out-districts, that Blackburn supplied Darwen at the price they were charging to the largest consumers in Blackburn. That did not look as if they wanted to charge to outsiders a price in addition to the price they charged in their own borough, and it had to be remembered that they had the option of either letting them have the supply or refusing it. Like Mr. Hutchinson, he would have liked to hear from Mr. Newbigging a few words about the differential rate inside the borough. In his own case they had four rates. They had the ordinary cottage consumer at a certain price, but below that they had other two prices. They made a difference of 3d. per 1,000 cubic feet, and 2½ per cent. to mill owners. In addition to that, they had gas for cooking and heating at 1s. per 1,000 less. In the case of mill owners who got their gas at 3d. per 1,000 cubic feet less and 2½ per cent. discount, they also claimed to have their houses supplied at the same rates. If the mill owner had one or two sons who claimed to be partners in the concern, they claimed the same privilege for their houses. After that, they had the shareholders in a limited company claiming to have their gas at the same reduced rates as the company was supplied at. They were not prepared to go quite that length, but they allowed partners in mills to have the gas at a reduced price. As to the right or wrong of that, he had his doubts, although, as Mr. Hutchinson said, the capital of companies and corporations was lying comparatively idle the whole of the summer. There was no reason, as he thought, why the largest consumers should have the gas at a much lower price than the ordinary consumers.

Mr. Newbigging suggested that it would be better that they should confine their attention to the particular branch of the question which he had dealt with in his paper. There was ample scope for a paper and discussion, at some future time, on the differential rates of another kind.

The President concurred. There was plenty of scope for another paper, and perhaps Mr. Newbigging would favor them with a second paper.

Mr. Valon, on being called upon, said he was under the disadvantage of only having just run his eye over Mr. Newbigging's very instructive paper. Therefore he would only say what was in his mind, almost independently of the opinions he had heard expressed, or of the paper itself. He was afraid he did not quite see the policy of a company or corporation charging a differential rate in the sense Mr. Newbigging indicated—that was to say, charging consumers a higher rate because they lived some distance away. One reason against the practice was that when a corporation or company went to Parliament they mapped out a district, and they asked to be allowed to supply that district with gas. The people who permitted them to supply—because it was a per

mission and a privilege—did so on account of certain benefits they were to receive, and he did not see why the corporation or company should afterward seek to charge different prices in different parts of the district. The charging of a differential rate was one of the most prolific sources of trouble between gas consumers and corporations, and therefore, without enlarging his remarks, he would say that where an Act of Parliament covered a company, and that company supplied the whole district, he thought it was desirable that a uniform rate should be charged.

Mr. W. S. Haddock, Warrington, said that in Warrington they were surrounded by many villages, in which an extra charge was made of 6d. per thousand cubic feet per mile of main. But even charging this differ ential rate they would have preferred not to supply the district, with gas it did not pay them. A couple of miles of the mains did nothing, practically, except to carry the gas to these outlying districts, and the cost of maintenance was considerable. If a man went out to repair, say, a small leakage in a pipe, it took him a good deal of time to go out and come in, and of course his fare had to be paid there and back. If they were going to supply a town it was all very well to have only one rate, but if the district was a growing one, as theirs was at that time, it would mean that every time they took a fresh district they would have to go in for a fresh Act of Parliament. To cover themselves they had at Warrington charged this differential rate, and they would have been unable to supply the consumers in the out-districts unless they had charged a differential rate. The advantage to the corporation was not so great as the figures might suggest. Of course, as the out districts grew and be came almost a part of the town, no doubt the people would go in for a reduction, and it would be right for them to do so when the extra miles of mains became productive.

Mr. W. R. Chester, Nottingham, the next speaker, remarked that he and many others would heartily congratulate themselves if they could charge a differential rate of 6d. per thousand for every added mile of main. In his case it would enable him to charge 4s. 6d. per thousand cubic feet extra in some districts. They had a very large number of villages and borroughs outside Nottingham, and they were supplied with gas at the same price as the largest consumer in Nottingham, and that now seemed to many people in the borough a very great hardship, although at the time the corporation acquired the gas works they were prepared to forego the differential rate and supply the out districts at the same rate as the large consumers in the borough. There was no doubt that in many respects these districts were supplied with gas at greater expense than the borough itself could be supplied at. The cost of mains was larger, the cost of the inspection of meters was larger, and other expenses were heavier. But at the same time they had got to put to themselves the question, What would be the position in which they should find themselves if these out-districts were entirely cut off from them? Undoubtedly the gas supplied to these districts helped to reduce the permanent price per thousand cubic feet. In his own case it would mean knocking off 187,000,000 cubic feet, or one-eighth of the total consumption; and although that eighth were knocked off, the fixed charges would probably remain as at present, and consequently they would not be able to supply gas to the consumers in the borough at as low a price as was now charged. At the same time there was no reason in the present arrangement, and if one were in a position to charge a reasonable differential rate he did not think the consumers in the out-districts would raise any objection to it. The objection was only to the charging of an exorbitant differential rate, and to charging against outside consumers large expenditure on works which was taken out of revenue instead of out of capital. Not many miles from Manchester there was a borough which did that to a very large extent, and the result was that when they came to be tackled in Parliament they had to accept a different condition of things. They were forced to supply outside districts at the same rate as the borough, because they had been piling up sums spent on extensions in revenue account which ought to have come out of capital.

Mr. Thos. Newbigging—Name, name.

Mr. Chester said it would be better not to give the names. His point was that, if corporations and companies would only charge a reasonable sum to outside consumers, there would be no difficulty in connec tion with a small additional charge of 2d. or 3d. per thousand cubic feet, which would be sufficient to cover all the additional cost of distribution. He took it that the question of differential rating was a very wide one, much wider than Mr. Newbigging had embraced in his paper, and that it afforded scope for a large amount of interesting discussion.

Mr. R. Hall, Matlock Bath, said it might be of some interest to those connected with small companies if he narrated his experience. They supplied gas in the districts of four local authorities, and they had no differential rate—they charged all alike. He was quite certain of one thing—that any attempt to charge a differential rate would provoke a great hubbub. In the consideration of this question one thing was clear, that if there was as much consumption in the out-districts as in any other district there would be no cause for a differential rate. In small townships the great thing they had to do was to keep up the consumption. If they were permitted to supply out-townships the consumption was thereby increased, and thus indirectly, if not directly, the owners of the works benefited by the reduction of the permanent charges. If they saw that the laying down of a main would bring them sufficient profit, then the indirect advantages were such as to justify them in supplying all at the same rate.

Mr. Carr was proceeding to deliver a second speech, replying to some of Mr. Chester's conclusions, when he was ruled out of order, on the ground that he had already spoken.

The President said that whatever difference of opinion might have been shown in the discussion, he thought there could be only one opinion as to the high quality of the paper read to them by Mr. Newbigging. For himself, he thought the question of liability was one that was entitled to more consideration than any speaker seemed to have devoted to it. At the present time the liability was certainly thrown on the boroughs which owned the gas works. Whatever might happen, the cost must be borne by the ratepayers, and the ratepayers in the out-districts had no liability whatever. That being so, he thought they ought to be charged something extra for the works that had been erected and carried on in the borough for their benefit. In his own case they charged a round sum of 6d. per thousand cubic feet to all outsiders. But there might be some boroughs which had extended so much of late years, taking in the out-districts, that there were very few of the out-townships left. It was so in the case of Birkenhead, which was a comparatively new borough. He had taken out a few figures to show how they stood there at the present time From the gas consumed in the borough their revenue was £53,017, or £646 per mile of main; and from the out-districts the revenue was £3,874, or £250 per mile of main. So that it appeared that there was nearly 2½ times more received from the borough than from the out-districts. In the borough they had about 4½ million cubic feet per mile per annum, and in the out-districts 1½ million cubic feet per mile per annum. Then, again, they had 15 per cent. of their total length of mains laid outside the borough, and only 6 per cent. of the total gas sold was consumed there. He did not think the 6d. extra they charged was at all excessive, considering the capital they had lying in the out-districts.

Mr. Newbigging, in reply, said he was very pleased with the discussion that had taken place on his brief paper. He had no doubt that it would be very useful, more useful, perhaps, than the paper itself. Some disappointment had been expressed that he did not take the whole subject of differential rates. Well, in justice to himself, he thought he should state the circumstances under which the paper was written. He did not know whether two or three of the members had not promised to contribute papers, but if they had, they appeared to have disappointed the secretary a few days before the time announced for the meeting, and the secretary asked him if he would do something. He agreed to do it, and read the paper on "Differential Rates," and it was the only paper that was read at the meeting, so that he might be excused if, in the time at his disposal, he did not take the whole subject. But he did not offer that as an excuse at all. He thought there was ample room for a good discussion, and that there had been a good discussion, on this particular branch of the question of differential rates; and in view of the difficulty in getting papers it was as well not to absorb all their material at once, but to hold some of it in reserve for future meetings. He did not promise to read a paper on the other branches of the subject, but he hoped that some member or members would take the matter up. Mr. Carr, who opened the discussion, explained that the additional cost of maintenance, collection, and so on, was a justification for the charging of a differential rate, and he quite agreed with him. He did not think it was just to the consumers within the borough, who had all the responsibility of finding the capital of the concern, that they should also be fined—because it meant that—that they should be mulcted in a certain sum in order to supply the outside consumers. And Mr. Carr further referred to the case of Oldham, and said he did not think that even there it was fair that the differential rate should have been done away with. He (Mr. Newbigging) thought so too. He did not think it was fair, but in his paper he explained the circumstances under which the differential rate was taken away. It must be remembered that Parliament was all powerful. Parliament might do right or wrong. It was not always a question of what was right, but a question of what you could get, so that it did not follow that although Parliament said you

should not charge a differential rate that it was not right that it ought to be charged. Even in the case of Oldham it ought to be charged. Mr. Craven did not charge a differential rate in his district, but he said he supplied the out-districts at the same rate as the consumers within the borough by way of a bribe, in order to induce them to become part of the borough. Of course, that was one way of looking at it, but he did know whether Mr. Craven's constituents would exactly agree that that was a proper thing to do.

Mr. Craven—If we did not do that they might be making gasworks of their own, you know, as they want to do at Eccles.

Mr. Newbigging (proceeding) said that with regard to Mr. Hutchinson's complaint he had already said something, and he would only add that half a-loaf was better than no bread. Mr. Duxbury had explained that when he was in a strait he was supplied from Blackburn, and that the Blackburn people only charged Darwen the price paid by their own largest consumers, and he argued from that that the Blackburn people were quite satisfied, and that if they had to supply Darwen they would not have charged a differential rate. He did not think that was a proper inference to draw. What had happened merely showed that the Blackburn people were willing to oblige their neighbors when they were in a difficulty. It must be remembered, too, that the Darwen people had paid for the mains through which they were to receive the Blackburn gas; otherwise Darwen might have been charged more. Mr. Valon, he felt sure, had been laboring under a disadvantage in not having read the paper, and he was sorry that he had not had the opportunity of reading it, because any opinion coming from him must have great influence when it was published in the gas periodicals. Mr. Valon did not see the wisdom of the propriety of charging a differential rate to consumers because they were a distance away from the center of supply. But that was not the reason why they were charged a differential rate at all. It was not charged because the consumers were a distance away, but because the outside districts were usually scattered districts, because the capital and the cost of collection (as the President had well said), and the cost of repairs were heavier in these out-districts. Furthermore, the consumers in the out-districts had no responsibility with regard to the capital of the undertaking.

Mr. Valon said they had to contribute to the profits.

Mr. Newbigging said he had met that point in his paper by suggesting that only a reasonable differential rate should be charged. He did not believe in making an unreasonable profit. Mr. Valon further said that Parliament allotted a district; that they gave the power to the company or corporation to supply a particular district. Very well, so Parliament did, but Parliament also gave a differential rate—Parliament allowed a differential rate outside the borough, so that——

Mr. Valon said what he intened to convey was, not that Parliament gave a district, but that the districts were granted to the borough, and granted because they were asked for.

Mr. Newbigging—Just so, and they also got a differential rate because they asked for it. Mr. Haddock appeared to have the right to charge 6d. per thousand cubic feet extra for each mile of main. He (Mr. Newbigging) did not think it would be wise to do that at all, and, of course, although Mr. Haddock had the right, it did not follow that he exercised it. He could, however, imagine instances in which even 6d. per thousand cubic feet per mile would be a justifiable charge, in very sparsely-populated districts. Mr. Haddock further remarked, very properly, that as the out-districts grew they would expect a reduction. So they might expect it, and if the corporation and the engineer were reasonable they would get it. Mr. Chester felt it was a hardship that they could not charge a differential rate at Nottingham. He (Mr. Newbigging) thought it was a hardship, and that it was unfair. But, by the way, did they ask for a differential rate?

Mr. Chester—No.

Mr. John West—It was an arrangement when they took the works over.

Mr. Newbigging said he thought that, in any case, it was an injustice that they should have to find the capital and pay more for their gas in order that the outside consumers should have it at the same price. There must always be a profit, and why should not there be a profit when they had to run the risk of all the capital that was required, because they must admit that there were risks, or, at all events, they must assume that there were risks, in face of the competition of the electric light, of oil, and other matters. Then, again, Mr. Chester said that perhaps it was as well he could not charge a differential rate, because these people might be cut off from the Corporation area of supply; but why should they be cut off? It might be said that Salford was threatened to be cut off, but that was perfectly voluntary on their part, and certainly it was not a thing he recommended, although he was employed on the Bill. The proper thing was to charge a reasonable rate, and if that was done, there was no danger of the outside districts being cut off. He thought Mr. Chester might have named the particular borough to which he referred as being in the habit of making exorbitant profits. Mr. Hall was manager of a small company which had no differential rate. He was glad Mr. Hall had spoken on the subject, because it gave one a chance of explaining why he charged no differential rate. The whole of Mr. Hall's district was thinly populated—perhaps the outside districts were as thickly populated as the district in which the company had its headquarters; and in a case of that kind there was little or no justification for charging a differential rate. And, further, Mr. Hall's was a private company—it did not belong to a borough or local authority of any kind, so that only the shareholders, and not the people of the district, were liable for the capital invested in the concern. The President, he was glad to find, agreed with him in thinking that a differential rate was justifiable, and he had furnished a very excellent argument in favor of it. He had not heard a single argument during the discussion that convinced him for one moment that it was unjustifiable to charge a differential rate outside a borough if it was a sparsley-populated district, and the consumption was, say, 50 or 30 per cent. less than in the borough. He saw no justification whatever for charging outside consumers at the same rate as those within the borough.

The Western Bituminous Coal Trade.

The *Iron Age* says that for a number of years past the Western bituminous coal trade has been in very unsatisfactory shape for the mine owners. The production of coal has been in excess of the demand, and the markets have been so glutted that the business has been one of the worst for either a capitalist or a workingman to be connected with. The bad condition of the trade has, of course, been intensified by the substitution of natural gas for fuel in important manufacturing sections. It is now claimed that the tide has turned and consumers are seeking favors at the hands of the mine owners. The Indiana coal miners strike was the last thing needed to bring out the facts. It has caused a coal famine in a part of the West, consumers finding that they cannot so readily as of yore turn to other coal-producing sections for their bituminous fuel. W. P. Rend, of Chicago, one of the largest operators in the country, was interviewed last week on the subject and made a very interesting statement, which is as follows:

While in Pittsburgh in the early part of the week I read in the public papers a dispatch to the effect that there was a coal famine in Chicago. This report I regarded at the time as highly sensational, or at least an exaggeration of the true facts of the situation.

On my return home, however, I find that this public report is not only true but falls far short of describing the great scarcity of soft coal here and elsewhere throughout the Northwest. Figuratively speaking, manufacturers, railroad purchasing agents and large coal consumers are begging and imploring on their bended knees the bewildered coal operator and coal dealer to let them have a supply of coal that will keep their industries and interests from suffering serious loss and injury.

Many of the appeals for coal are coming in the shape of the most urgent entreaties. On my desk there is now a stack of letters and dispatches from dealers at various places in several States clamoring for fuel. To illustrate their general tenor, I will repeat the words of distress from a coal dealer in Indiana. He cries: "For humanity's sake I beg of you to send me some coal. The people of my town are famishing for fuel." The tone of many other letters and telegrams is no less earnest. Railway general managers in many cases are sending dispatches urging forward fuel and expressing fears that unless shipments are increased at once their trains will be forced to stop. In fact, there is not bituminous coal enough at present to satisfy the enormous and phenomenal demand. The coal dealer is fairly at his wits' ends trying to care for the various large industrial and other interests requiring coal for their operation.

The production of coal is now greater than ever before in the history of the country, but great as it is the demand is much in excess of the output and of the means of transporting it to market. The causes of this condition of things are numerous and complex. The general scarcity of coal affects most of the Northwest, but in our local market this is greatly intensified by the strike in the coal regions of Indiana. A vast quantity of this coal is sold in Chicago. The late sudden strike in the extensive coal producing region of Brazil, Ind., shuts out the shipment of that coal from this market, and forces those who have been using it to purchase Illinois and other coal in its stead.

In Ohio and western Pennsylvania there is now a home market for nearly all that can be produced in those sections, and little of this East-

ern coal can be spared at present for the West. The failure of gas, or its greatly diminished supply, in Ohio, Pennsylvania and Indiana has forced its abandonment by manufacturers in Pittsburgh, and, in fact, almost every place in Pennsylvania, and in such places in Ohio as Dayton, Columbus and Springfield, and in Indianapolis and almost all the manufacturing towns of Indiana. The coal required to take the place of natural gas amounts to a vast tonnage. The stocks of coal in Cincinnati laid in last spring and summer from shipments down the Ohio and Kanawha rivers from Pennsylvania and West Virginia are about depleted, and that city has not now a week's supply ahead. The Ohio river has been low for months, and no coal has been or can be floated down its stream to Cincinnati, Louisville and other places getting their supply in this way. The railroads everywhere are taxed to their utmost limit in moving the crops of the country and other merchandise required for general use.

This vast traffic requires vast quantities of coal for locomotive purposes. Cars for the transportation of coal are insufficient, and as a consequence almost every colliery in the country is unable to get the full complement of cars required to keep it in full operation or that will enable its operators to take care of orders pouring in upon them. There is in most places also a scarcity of miners. During the last two or three years comparatively few miners have come here from Great Britain or from the continent of Europe. In England, Scotland and Wales during the period I have named, the hours of labor have been reduced and rates of wages have been greatly increased. As a consequence the inducements offered to miners to immigrate to this country are not what they used to be, and the supply of skilled miners from abroad has of late grown less for the coal fields of this country.

There are other causes not necessary to particularize operating upon the coal situation and upon the coal mining industry affecting the supply and demand. I can add, however, that the prosperous condition of the country causes an increased consumption of coal as well as of other commodities for domestic and other uses. Suffice it to say, bituminous coal is now wanted, and wanted badly, and especially so in Chicago.

Machinery Hall and the Electricity Building, World's Fair.

Mr. James Dredge, one of the Editors of *Engineering*, and a member of the Royal Commission (England), appointed to overlook that country's official connection with the coming World's Fair, recently read (December 9th) a very complete paper before the Society of Arts, on "The Columbian Exposition of 1893." From it we take the chapters relating to "Machinery Hall" and "The Electricity Building," in the belief that they will furnish interesting reading, the interest in the same to American gas makers perhaps being intensified by remembering what was said in our last issue about the proposition made by Mr. Burnham, in his reply to the World's Fair Committee of the American Gas Light Association as to the request of the latter for an allotment of ground whereon to construct a building suitable for the requirements of an appropriate display in connection with the gas industries of the country. The author said :

CHAPTER V.—*Machinery Hall.*—The Machinery Hall is 500 feet wide and 850 feet long ; with its annexes it is to cover an area of about 17 acres. At one end and connected with it is an annex 500 feet wide and 550 feet long. The position of this very important building is shown on the plan, where it will be seen that its principal facade faces on the Grand Avenue ; it is this facade upon which the chief architectural detail is concentrated. Beyond it and at the head of the short canal branching from the basin, the facade of the Machinery Hall is connected with a colonnade that adds greatly to the imposing effect, and at the same time serves as a screen to separate the stock yards of the Exhibition from the rest of the grounds. This colonnade, which is of considerable extent, is carried as far as the Agricultural Hall, so that the visitors can pass from one to the other without being exposed to the weather. The general scheme of the main building of the Machinery Hall behind the ornamental exterior is rectangular, and the vast space is divided into three galleries, each about 130 feet span ; there will, therefore, be no very extensive engineering work in this building. In the center of the hall the three galleries just referred to will be crossed by a transept of about the same width, and the intersections are marked by the construction of three domes. At each corner is a large pavilion with a domed roof ; entrances to the building will be provided in each of these pavilions, but the main portals will be on the north and east sides where the classic porticoes will be placed ; these porticoes will be flanked by towers 200 feet in height. Between the corner pavilions and the central entrances on the north and east sides, the exterior will consist of open loggias or colonnades two stories in height and with internal galleries ; these are covered by a flat roof. A similar flat roof covers the outer part of the building on the south and west sides, but as these sides will not be so much exposed, elaborate architectural effect is dispensed with. The building will be lighted by skylights over the flat roofs, and by raised lanterns at the top of the main arched galleries ; the greater portion of the domes will also be glazed. Most of the framing of this building will be of steel, though all the skeleton of the exterior is of timber very cleverly arranged and covered with cement and "staff," in the same way as all the decorative effects of a similar nature are obtained throughout the Exhibition. The foundations, however, are of wood, designed on the same lines as those already referred to when I was speaking about the great buildings of the city. Only as the structures at Jackson Park are temporary, it was not considered necessary to incur the considerable cost of iron and concrete platforms, but precisely the same method of distributing the weights has been adopted except in those cases where the uncertain nature of the ground rendered piling a necessity. Extensive galleries will be erected around the interior of the building at the same height above the ground as the galleries of the loggias before mentioned ; they will be reached by eight main staircases and a number of subsidiary ones, as well as by elevators. The annex to the Machinery Hall will be built largely of wood, and will have no pretension to architectural elaboration. On the south side of the main building a boiler-house will be erected, 80 feet wide and 600 feet long. In this building will be generated all the steam required for the great power station that is to furnish the Exhibition and grounds with the necessary energy, calculated at present at 25,000 horse power. The engines by which this force is to be generated will be placed together within the Machinery Hall, a sufficient area on the south side being reserved for that purpose. It is intended that both engines and boilers, with all the auxiliary machinery, should constitute exhibits, and as this is a point upon which some of our manufacturers will certainly feel considerable interest, I reproduce here the official information as to the terms on which steam-engine exhibits, intended to form a part of this power station, will be received. "Engines aggregating 25,000 indicated horse power will be required. These must all be compound, either cross or tandem, horizontal or vertical, or triple expansion. These engines may be of any automatic type, high or low speed, and must be condensing, manufacturers to furnish condensers. Steam pressures will be of 125 lb., 150 lb., and 200 lb. per square inch ; either pressure may be used at the option of the exhibitor. The work to be done will be generating electricity either for arc or incandescent lighting, power transmission, or driving line shafting. No engine shall be of a smaller capacity than 150, nor of a greater than 1,000 horse power. If it is desired to drive line shafting, engines should be of low speed and capable of working up to 325 horse power, with an economical working load of 160 horse power. For operating dynamos they may be of any type, and capable of developing from 150 to 1,000 horse power. The basis on which engines will be accepted will be as follows :—Such engines are to be consigned by manufacturers to the World's Columbian Exposition, and will be placed upon foundations free of all costs to the executive, which will prepare foundations of concrete, according to drawings furnished by the manufacturer, will make all steam and water connections, maintain, operate, and furnish all supplies, such as oil and waste, during the Exposition ; the manufacturer to remove the engine at the end.

"The engines will remain the property of the exhibitor, and will be considered as exhibits in operation. Exhibitors will be required to furnish operating engineers, whose wages will be paid by the Executive, and who will be subject to the direction at all times of the Chief of Construction. Such manufacturers as decide to exhibit engines under the above conditions should make application without loss of time to their respective commissions."

This very large power station will be utilized not only for transmission of machinery in motion in the Machinery Hall, but for distributing current throughout the various buildings and grounds, for power, lighting, and other purposes. It should be mentioned in this place that it is the present intention of the Executive to introduce a complete novelty for driving machinery in motion. The great success that has attended the distribution of energy by compressed air on the Popp system in Paris, has encouraged the Executive to employ this means of operating the machinery in motion. The advantages attending this innovation will be very great ; not only can cold air machines and refrigerating machinery be supplied direct, but the Machinery Hall will be kept cool—a very important consideration during the summer. Besides this all the many annoyances to exhibitors and visitors arising from leaking steam pipes and defective joints will be avoided ; leakage will be an ad-

vantage instead of an inconvenience (except as regards loss of power), and a great complication in the mains beneath the flooring will be avoided.

If this project is put into execution a large amount of air-compressing machinery will be required ; this will be treated by the Executive much in the same manner as the engines already referred to above.

Returning to the power station, it will be realized that the greater part of the 25,000-horse power will be required to drive electric current generators, which will also be exhibits. A very elaborate system of underground mains will be laid in tunnels constructed so as to reach all parts of the building requiring light or power, and every part of the grounds. A circular electric elevated railway will be constructed so as to include the principal buildings, and as on this very frequent trains will be run, a large amount of power will be consumed. Current will be delivered to all the separate buildings of States and foreign countries, and such power (of course with some exceptions) as will be required to show machinery in motion in various parts of the grounds will be furnished from the central station. It is the intention of the Executive, during the Exhibition, to subject—if the exhibitors approve—all the machinery employed in connection with the central station to an elaborate and careful system of trials, so that the actual and relative efficiencies may be ascertained.

The Electrical Department, the Chief of which is Mr. F. Sargent, desires to give every possible encouragement to foreign electrical engineers and contractors, to induce them to compete for the contracts of laying mains, providing lamps, generators, motors and other plant that may be required in carrying out the electrical system of the Exhibition, and also to tender for the maintenance of such work during the continuance of the Exhibition. Such competition would no doubt be of great interest to some of our industrials, but I am informed that if such work were done as an ordinary contract, and not as an exhibit, the tariff regulations would make it difficult, if not impossible, for any foreign contractor to compete. If, therefore, the Exposition authorities desire such foreign co-operation seriously, it rests with them to meet these difficulties so as to place foreign manufacturers on equal terms with those of the United States.

The space reserved for Great Britain and her colonies in the Machinery Hall is 40,000 square feet—about the same space which she occupied at the Centennial Exposition of 1876. Whether under the existing conditions of trade and competition with the United States it will be possible for us to occupy this large area, it is too early to predict ; it must be borne in mind that any machinery shown in the Transportation, Electricity, or Mines Building will be placed there at the expense of Machinery Hall. Still, I think that there are sufficient manufacturing engineers in this country whose interests in the United States—either actual or prospective—or with other countries, are important enough to induce them to make a fair, though perhaps not a representative display. The architectural work of the Machinery Hall is by Messrs. Peabody and Stearns, of Boston.

CHAPTER VIII.—*The Electricity Building.*—Electricity Building covers an area of 250,000 square feet, and is estimated to cost $130,000. The architects are Messrs. Van Blunt and Howe, of Kansas City, and the design appears not only admirably adapted for its purpose, but sufficiently well-proportioned and ornamental to take a front rank among the many splendid buildings on Jackson Park. The main entrance to the building faces on the great central avenue, near the Administration Building. The principal architectural feature at this end of the building is a portico and colonnade extending for the whole width on each side of the monumental entrance, over which are inscribed a series of names famous in the annals of electrical science. The main tower at this end reaches an elevation of about 200 feet, those at the sides being somewhat shorter and of more slender proportion. Except for the two large bays at the back of the building, the plan is rectangular, the length being 690 feet, and the width 345 feet. The center of the building is occupied by a large hall, running from end to end, and about 115 feet span, flanked by a double row of columns and aisles 70 feet in width. Important entrances will occupy the center of the building on each side, and access is gained to the galleries by broad stairways occupying the middle of the building. The end bays will be glazed so as to afford as much light as possible. Large as are the dimensions of this building, it may be confidently expected that they will be insufficient to accommodate the exhibit. Electricity and its practical applications will be one of the largest and most important sections of the Exhibition, and during the next two years there will, doubtless, be many new developments not yet brought into a practical form. In connection with this building, some general particulars of the scheme of electric lighting at Jackson Park may be given. The plans have been elaborated by the chief electrical engineer, Mr. Sargent, and his proposals have been accepted by the committees on electricity, on the grounds and buildings, and by Mr. Burnham, the chief of construction. As upon every other point, so in this matter of illuminations, the Executive appear determined to surpass all that has been hitherto attempted in this direction at international exhibitions. In 1889 only three of the main buildings were opened at night to the public and furnished with electric light. It has now been decided that complete arrangements shall be made for lighting every one of the great halls at Jackson Park as well as the extensive grounds. The scheme elaborated up to date refers to nine of the great buildings, and comprises 5,180 arc lamps of 2,000 candle power each, and 14,700 incandescent lamps of 16 candles. Except in the Fine Arts, the Administration, and the Women's Buildings, arc lights will be employed and will be distributed as follows : In the Machinery Hall there will be 600 ; in the Agricultural Hall, 600 ; in the Electric Building, 400 ; in the Mines and Mining Building, 400 ; in the Transportation Building, 450 ; in the Horticultural Hall, 400; in the Forestry Building, 150 ; and in the Industrial Arts Building, 2,000. As just stated, there will be no arc lights employed in the Fine Arts Buildings, but in their place the interior will be lighted by 12,000 incandescent lamps. The Administration Building will be illuminated in the same manner, and about 10,000 16 candle lamps will be required for this purpose. The lighting of the Women's Building will be mixed, and comprise 180 arc lamps and 2,700 incandescent lamps. In addition to the lighting supplied by the authorities, any exhibitor who requires it will be able to obtain current for lighting his display, in any manner he thinks fit, conformably with the lighting regulations. It is presumed that this current will be furnished to private consumers at a fixed and very moderate tariff. The arrangements for lighting the grounds, for the illuminated fountains, for private lighting and miscellaneous purposes, have not yet been completed. It is decided in principle, however, that every one of the numerous pavilions and official buildings will be abundantly supplied with electricity, so that any reasonable amount of light can be obtained, and gas will be practically, if not actually, unknown at Jackson Park as an illuminant. It is intended, amongst other novel applications of the electric light, to illuminate the harbor inclosed within the pier and breakwater, already referred to, either wholly or in part, with submerged incandescent lamps so arranged that the light may be thrown upwards towards the surface of the water. Such an arrangement would undoubtedly consume a large amount of power, but the effect would be very striking and attractive.

It should be mentioned that already a large amount of electric power is available on the grounds, an extensive installation having been completed and put in operation. It has been ordered by the Executive that the contractors are not to be allowed to use steam power, but that they must work all their machinery by electricity ; this has been done to reduce the risk of fire during the progress of the work. All the saw mills set up for the Industrial Building are driven by this means, and the contractors for the Administration and Horticultural Buildings are already using a considerable amount of the same power. There are at the present time at least a dozen motors driven by current furnished from the temporary central station. This is an entirely novel application of electricity in connection with exhibition buildings.

A very considerable amount of current will also be required for lighting the grounds through the long winter nights, during which work will be carried on continuously by different shifts of men. The arrangements made between the Executive and the directors of the labor unions limit the length of daily work to eight hours. By this means the Executive is confident that they will carry the work forward to its conclusion without any interruption due to labor troubles.

Heat in Its Relationship to Electricity and Its Influence upon the Animal Body in Health and Disease

In the course of a paper, read by Dr. J. D. Bonnar before the Buffalo Electrical Society, the author remarked : We all know that the great source of light and heat is the sun ; in fact we may truly say, of all motion, either of masses or molecules, that its origin may be traced to the sun—the great luminary of day and night. The cause of heat is rays from the sun, and by pressing this investigation still further we will find that heat and electricity bear a very striking relationship to each other. We all know that heat and motion are convertible terms ; either will produce the other. This is true of matter in masses or in molecules ; but we find that the combination of substances having chemical affinities for each other produces heat. Here we must conceive of the motion being a movement of the atoms or molecules to form a new compound ; but by so doing we find as an accompaniment of the process heat and electricity.

To go back to our starting point—viz., that the sun is the origin of all heat, and also of all light. We are told by astronomers that the sun is a great molten mass. From our own experiments we learn that all bodies which combine chemically with each other have certain opposite electrical conditions, and they unite with each other, producing an electrical current, which may be conveyed along wires to distances remote from the place of origin. We find that the electrical conditions are in definite and constant proportion to the attraction or force with which bodies seek to combine with one another. Hence may we not justly conclude that in the sun the same conditions control the chemical combinations continually going on in its structure? If we are justified in this inference, then we are also justified in the assumption that electrical attractions between the bodies entering into combination are set up and currents sent in all directions throughout the solar system, and only producing light and heat when they reach the atmosphere which envelopes the earth. The currents of electricity are met by the resistance of the atmosphere, which is a very poor conductor of electricity. Hence we have both light and heat, which we know are produced by electrical currents when transmitted through bad conducting media, such as platinum wire or bamboo cane, and just in proportion to the resistance offered in the track of the electrical energy. The diffused light of day can then reasonably be regarded as the fruits of the infinitely great number of electrical rays passing from the sun through the resisting atmospheric media. When the air is full of moisture the day is darker, due, no doubt, to the well-known fact that moist air is a much better conductor of electricity than dry air, presenting as it does much less resistance to the electrical effort to reach the earth.

A friend of mine very tersely remarked that the sun "might then be looked upon as a huge battery," in which the elements are constantly combining and decomposing, and thereby originating or generating electrical rays, which I have been endeavoring to show are the direct agents in the production of light and heat. When the sun sets at night we generate electrical rays by means of dynamos, propelled by energy laid up for ages in the coal fields—detached charges, as it were, deposited there by the sun's rays in the carboniferous age. Or the energy may come from a fall of water like Niagara, which will be utilized for the purpose of generating electricity. The waterfall in the first place gets its potential energy from the sun's rays which evaporated the water, and in fact the sun is continuously carrying the water uphill again, for future use. What I claim is that the agent in all this work is primarily electricity, and it may be expressed in the various conditions of heat, motion, chemical action, and light.

As already mentioned, heat and electricity are so intimately related, as to be, in fact, an offspring the one of the other, and it often tests the discernment of the most astute reasoner or observer to tell which is the parent power. I am of the opinion, and hope that I may have some support from you here to-night, that electricity is the parent power, and heat is one of the first born in this illustrious family—heat, motion, chemical action and light. What I wish to draw your attention to just now is the fact that co-incident with an increase in the electrical potential in a body or part of a body, there is also an increase in the heat of the same, and when our bodies are in a highly electrical condition or in high potential, we are warmer than when the potential is lower; so, therefore, we find people more vivacious and merry in dry and bright weather than in damp conditions of the atmosphere. By means of the moisture the electrical potential is lessened. Again we find that in all inflammatory conditions there is an increase in the positive electricity, *i. e.*, the potential electrical energy is increased, and as we all know the rule, that positive repels positive, and negative repels negative, and vice versa: so, therefore, we treat inflammation and all diseases which show increased activity in a part, by applying the positive pole over the affected part. Or, conversely, in affections where there is a deficiency in the normal activity, we reverse the electrodes, by applying the negative over the seat of the disease, while the positive is applied at some point remote from it. Thus we strive to bring about a physiological, natural, or normal state of equilibrium.

The proof of the foregoing principles can be had by a study of the electrical currents set up in voltaic pile, or in the crown of cups. A current is set up by the contact of two different metals, such as zinc and copper, the strength of the current being accentuated by the intervention of an acid or a saline solution and in proportion to the number of pairs. This simple contrivance shows that the current flows from the metal of higher to the one of lower potential, and the same is true in animate bodies as in the inanimate metals. How often have we all noticed that there is a peculiar sensation, or, in fact, a slight shock, experienced when we shake hands with some people, the cause being simply, that the electricity of higher potential in one is flowing over to the other of lower potential. As with water so with electricity, it is seeking its level whenever there is a way of escape from the higher to the lower. This is true also of heat. If you connect two rods or pieces of metal together which have been unequally heated, the current of heat, so to speak, runs from the warmer to the cooler metal, following the same law as its parent, electricity. Hence we infer that the uses of heat may be similar to those of electricity in the cure of disease; in fact, we are using this heat agent vastly more often than electricity, because its character and effects are vastly better known.

The Condensation of Steam.

It is known that in all steam engines liquefaction takes place in the cylinder, and this is invariably explained on the assumption that the metal being cooler than the steam with which it comes in contact, a transfer of heat takes place from the steam to the iron, condensation ensuing as a natural consequence. No doubt this is the truth, but is it the entire truth? Is this explanation consistent with facts and phenomena taken as a whole? Is the hypothesis competent to explain everything connected with liquefaction in steam cylinders? There is reason to think that the reply must be in the negative; and if so, then we are presented with an interesting region for physical research; one that can be better explored, moreover, by the physicist than by the engineer, because it is easier to carry out the requisite experiments with the great accuracy required in the laboratory than in the engine-room. Our object now is to state the case for inquiry; not to dogmatize, but to suggest.

It was at one time held that cylinder condensation largely depended for its amount on the range of temperature in the cylinder. We have heard it stated that, for example, if the range of temperature in a cylinder were, say, 100deg., and the condensation x lb. per hour, then, all the other conditions remaining unaltered, if the range of temperature were doubled the condensation would become 2 x lb. per hour; and engineers holding this view very naturally said that the compound and triple-expansion engines were more economical than simple engines, mainly because the range of temperature in each cylinder of the multi-cylinder engine was reduced, as compared with the range in the single cylinder. Reasoning of this kind is seldom or never heard now; because it is well known that cylinder condensation is greater in the triple than in any other form of expansion engine, unless it be the quadruple engine. In a word, facts all go to show that cylinder condensation is largely independent of range of temperature. But if this is really, as it is apparently true, then it seems to be clear that we must seek for some other cause of liquefaction. Furthermore, the amount of liquefaction shows itself to be royally independent, bearing no fixed relation to any condition. Thus in two engines practically identical, and working under similar circumstances, we shall find one condensing far more steam than the other,

The whole theory of liquefaction, as commonly stated, is that it can only be brought about by the steam coming into contact with something colder than itself. This assumption is taken for granted; it is held to be capable of convincing proof that so long as steam is kept in a vessel, the walls of which are at its own temperature, no condensation can take place. We are quite willing to grant this, but with a limitation; that is to say, it is quite true of steam kept at rest. The point in doubt is whether it is or is not true of steam in motion. A recent experience—not an experiment—throws some light on this question. Drains fitted to certain steam pipes, all supplied by the same battery of boilers, showed that small steam pipes invariably supplied wetter steam than large pipes. The steam pipes were all carefully clothed, clothed indeed to a quite unusual degree, and the loss by radiation must have been very small; but small or great, there was the water. It is very difficult to believe that in this case—concerning which we may have more to say at a future time—the temperature of the metal of the steam pipe could have had much to do with the amount of condensation. Let us consider for a moment what is the nature of the fluid—steam—with which we are dealing. It is of all others the most unstable that it is possible to produce. A touch with a feather is sufficient to upset the balance in the solid iodide of nitrogen, and an explosion ensues. A touch with a drop of cold water suffices to upset the equilibrium of steam, and the water molecules fall together like a flash. Again, we know that if a permanent gas expands, doing work the while, its sensible temperature falls; but when steam expanding does work a portion of it is liquefied. Here there is no question of transfer of heat from a hotter to a colder body. Again, we can go on compressing gas within comparatively enormously wide limits without producing liquefaction; but, says the *Engineer*, in the case of steam if there be water present

in sufficient quantity—somewhere about 30 per cent. will suffice—after a certain degree of compression has been reached, no further rise in pressure can be obtained. The steam proceeds to liquefy. The action is as though the water present absorbed it like a sponge. Here, again, we have liquefaction without transfer of heat from a hotter to a colder body. Thus, then, it will be seen that steam will liquefy whether it is doing or has work done upon it, and the action is often apparent in actual indicator diagrams, liquefaction taking place because of the presence of water during the compression period. But this is not all. The presence of some solid body appears to be essential to liquefaction. It has been shown by Mr. John Aitken that if air—that is space, for the air plays a secondary part—saturated with moisture be cooled, the moisture will not deposit unless there are dust particles present on which condensation can take place. During the delivery of a very interesting lecture on Liquids and Gases, delivered by Professor W. Ramsay, on May 8, 1891, at the Royal Institution, he showed an experiment to illustrate Mr. Aitken's statement of fact. "If," said the lecturer, "air be suddenly expanded it will do work against atmospheric pressure, and will cool itself. This globe contains air, but the air has been filtered carefully through cotton-wool, with the object of excluding dust particles. It is saturated with moisture. On taking a stroke of the pump, so as to exhaust the air in the globe, no change is evident; no condensation has occurred, although the air has been so cooled that the moisture should condense, were it possible. On repeating the operation with the same globe after admitting dusty air—ordinary air from the room—a slight fog is produced, and owing to the light behind, a circular rainbow is seen; a slight shower of rain has taken place. There are comparatively few dust particles, because only a little dusty air has been admitted. On again repeating, the fog is denser, there are more particles on which moisture may condense." This is a highly suggestive experiment, if regarded in a proper spirit. The difference between vapor suspended in the atmosphere and steam of any pressure is little more than one of degree. If vapor, although cooled, will not condense unless dust particles are present, it is fair to assume, first, that steam would not condense; and, secondly, we may proceed to ask, What effect a difference in the size of the dust particles and in their material would produce on the phenomena?

We believe that in the face of all the facts we have briefly placed before our readers, it is impossible to maintain that steam can only be liquefied by the direct abstraction of heat. We may now proceed a step further, and consider what may happen when steam is in rapid motion round turns and bends. Let us take it for granted, for example, that steam, rushing into a cylinder through crooked ports, comes into contact with metal just of the same temperature as itself, and the conditions are such that this metal can never get hotter than the steam. We have seen that the fluid with which we have to do is in a state of unstable equilibrium. The water molecules are only kept apart by the energy which has been imparted to them by the heat called "latent," but which is really no longer heat. If, now, something occurs to initiate liquefaction, there is no reason why it should not proceed until at least the metallic surface becomes covered with moisture, and the steam is no longer in contact with it. What, it may be asked, can initiate liquefaction under such conditions? The answer can only be tentatively suggestive. The thermo-dynamic theory of gases is supposed to apply to steam. According to it, the molecules are in rapid motion, bombarding the surfaces of the containing envelope, from which they recoil without loss of energy; but this recoil without loss of energy can only hold true of molecules which are perfectly elastic.

Let it be granted for argument's sake that the molecules in the steam are imperfectly elastic. So long as the steam is not in motion—and the motion of a current of steam must not be confounded with its intra-molecular motion—the difference in elasticity between steam and a perfect gas is too small to produce an appreciable effect. Let us suppose now that we have an India rubber ball, which, when dropped on the floor, will always return to the hand so long as it is only thrown down with a certain force, but let the force be augmented sufficiently to injure the ball and it can no longer return. Or to take another case, a steel shot is driven against an armor plate which it is unable to penetrate with a given charge of powder, and it rebounds uninjured from the plate. The charge of powder is increased and the shot breaks up. Now, it is evident that the molecules of steam which first rush into a cylinder when the port is opened, are driven clear across to the other side and violently impelled against the metal; and knowing how fine is the distinction between steam and water, how nice the balance of forces, is it too much to say that the imperfectly elastic molecules will not rebound, but will part with some of their energy to the metal, and falling together will assume the condition of water. All this is pure hypothesis. But it is hypothesis which is consistent with existing theories, and existing experiments. Let us, on the other hand, reject the idea that the knocking of steam about, its collision with cylinder walls, the bends in steam pipes, and such like, can have any effect; let us take it for granted that it is impossible, do what we may with steam, to condense it so long as it is in contact with a surface possessing the same sensible temperature. How are we, then, to reconcile this proposition with the facts which we meet with at every turn—the enormous amount of condensation which takes place in the well-jacketted high-pressure cylinder of a triple-expansion engine; the increase in condensation due to the use of small or crooked steam pipes, as compared with those that are larger or straighter; or the circumstance that steam separators, which depend for their operation on the "knocking" of the water out of the steam, often prove failures, taking out a good deal of water, and yet leaving the steam nearly as wet as they received it?

It is, we think, time that the questions we have raised were fairly and dispassionately examined. Either it is or is not true that other influences than mere difference of temperature can cause steam to part with its heat. It would not involve the expenditure of very much time, trouble or money to carry out at least a preliminary trial, which would throw a good deal of light on the points at issue. Thus, for example, a length of 100 feet of straight steam pipe might be fitted up, steam at a given pressure allowed to flow through it, and the amount of condensation measured by collecting, at the end furthest from the boiler, the water deposited. A similar experiment might then be made with a tube of the same length and dimensions, but put together with numerous sharp bends. Different experiments of this kind will suggest themselves. It has long been known to engineers that steam engines with short straight ports are better than engines with crooked and long steam passages. It would be instructive to ascertain to what the economy of the former is due. Is the cylinder condensation less in one case than the other? Finally, we would repeat what we said at the outset, namely, that we do not pretend to dogmatize; all that we have attempted is to show that there is a good case for further inquiry concerning the phenomena of condensation. The subject should be approached with an open mind, and the inquirer should not let himself be persuaded that everything is already known about steam that can be known.

Some Practical Disadvantages Incidental to the Generation and Distribution of Electricity to Consumers.

[Communicated by Mr. NORTON H. HUMPHRYS, A. M. Inst. C. E., F. C. S., to the London *Journal*].

On the principle, perhaps, that "there is nothing like leather," the writer has recently been led to compare the generation and supply of electricity, or at least so much of that art as has been made public at meetings of scientific or engineering bodies, with the operations conducted by gas undertakings. The results of such comparisons are interesting to gas engineers, at any rate, as throwing some light on both the advantages and disadvantages incidental to their specialty. It is obvious that in supplying or distributing any marketable commodity—whether fluid, gas, or one of the forms of energy—from a central station, by means of conduits through the streets, to the houses of consumers, there are certain sources of loss, which may be indicated by the term "leakage." These may embrace several different factors peculiar to the agents supplied; but all converge to the one fact—that a sovereign's worth put in at the works does not run out to a corresponding value when distributed. When weighing out a hundredweight of sugar or tea into 1-lb. packages, there is a certain loss due to the trifling overweight given on each package; and, in a similar manner, we find that, whether it is 1,000 units of electricity, 1,000,000 cubic feet of gas, or 10,000 gallons of water that are sent out, the quantity actually received by the consumer, and duly paid for, is something appreciably less. This may be due to leakage, overweight, or both. The agent may be *bona fide* reduced in value before it reaches the user; or it may actually be supplied, but not be accurately registered. If the supply is by contract, it may be either more or less than that stipulated for; or if by meter, the machine may be either "fast" or "slow." The supplier should be sufficiently honest to strictly fulfill his obligations in the matter both of quantity and quality supplied; and, on the other hand, sufficiently skilled in his own particular line to guard against overweight, and to see that the loss by leakage is reduced to the lowest possible point.

For many years gas and water retained sole possession of our streets, so far as distribution is concerned; but it is evident that they are not to enjoy this monopoly any longer. There is not only the supply of electricity, but also that of power, either by the medium of water or air,

steam for power or warming, to say nothing of pneumatic tubes, telephone wires, etc., and other developments of underground distribution which as yet are looming in the distant future. So that the question of distribution increases in importance every day. The escape of electricity or of high-pressure steam is more dangerous than that of coal gas; while a dash of water under 700 lbs. pressure per square inch from the hydraulic power system would be extremely inconvenient. Not only so, but the presence of each additional agent increases the common danger.

With the old plan of gas mains on one side of the road and water mains on the other, any leakage of gas or water began and ended without affecting anything beyond itself; but a similar accident in any of our principal Metropolitan thoroughfares might only be the beginning of a series. This has been exemplified in New York, where the bursting of a steam main shattered the adjacent gas and water pipes, and broke up the electric conduits—producing an electric discharge that fired the gas. So that when gas mains and electric conduits run side by side, we get an effect that may be illustrated by supposing a sportsman to carry his percussion caps and gunpowder in one common receptacle. The addition of a "power" system is another factor in the chain of circumstances that would intensify the effects of a disaster. Such liability to a sinister rendering of a chapter of accidents after the manner of the events portrayed in the old nursery ditty of "The House that Jack Built," renders the general subject of street distribution a matter of public importance. This consideration has, no doubt, led to the suggestion, which hails from the United States, of placing the subsoil of the streets under the entire control of a Municipal Distribution Engineer, who would see that each main or conduit was so arranged as to interfere as little as possible with its neighbors.

With fluids or gases, after allowing for every tangible source of waste or overweight, there still remain minute causes that may perhaps be represented by the terms "spontaneous evaporation." With gas there is the effect of condensation (if any); the liability to changes of temperature, and the consequent effect on the bulk; and the possible existence of exosmosis through the substance of the cast iron mains. So far, prolonged experience has enabled the practical effect of these to be determined with accuracy. In dealing with forms of energy which are of a more subtle nature than tangible substances, it seems probable that this spontaneous evaporation is liable to obtain to a greater degree. Electrical engineers are already directing their attention to the subject of "unaccounted-for" electricity. This is not such a simple matter as that of unaccounted-for gas, because the question of the distribution of electricity on a large scale is as yet open. The simple leading of lines direct from the dynamo to the consumers' lamps is held by many to be adaptable to comparatively small areas; and it is considered that the conveyance of large quantities of electricity for any great distance involves the use of high-pressure lines, with accumulators or transformers for converting the high into low pressure. This may be illustrated by supposing that the usual method of distributing gas direct from the holder to the consumers' meter was only suited to small towns, and that in large ones it required to be supplemented by trunk mains supplied with gas at a comparatively high pressure, with feeders leading into the low pressure system at regular intervals. On each feeder a district governor would be used, to keep back the excess of pressure; and this would correspond to the transformer. But, to make the parallel good, we must further suppose that the district governor involves a considerable waste, ranging from nearly nothing under the most favorable circumstances, to about 50 per cent. at the other extreme. With gas it has long been settled that the low-pressure system is the best. The present state of the electricity distribution question may be represented by supposing that the cost of gas mains was so great as to lead a large number of gas engineers to believe that the reduction of the first cost of the distributing plant, by the use of high-pressure trunk mains of relatively small diameter, would be more economical than that of low-pressure mains, having sufficient area to allow for loss of pressure in distributing, etc.

The material used for the conveyance of electricity in a practical way is invariably pure copper. Various shaped sections are used; and they are either surrounded with insulating material, or else laid naked, supported at intervals by non-conductors, in a small subway or conduit. In the latter case they are, in fact, air-insulated, just like telegraph and other wires carried upon poles.

(To be continued.)

MESSRS. J. H. LIONBERGER, Charles Green and Thomas E. Tutt were elected Directors in the Carondelet Gas Light Company, of St. Louis, for the ensuing year.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, Dec. 10, 1891.

The Weather.—Differential Rates.—The Blackburn Explosion.—Some Big Gas Flames.—Powers to Inspect Gasfittings.

An Englishman's topic of conversation is proverbially the weather, and if the residents of other countries experienced the remarkable vicissitudes that are the general thing here, they would not be surprised. Just now it is the principal topic in gas circles, being tapered down to a comparison between the mild autumnal weather that has prevailed during the last few weeks and the almost arctic severity that characterized the corresponding period of last year. Gas engineers regard the matter with mixed feelings. When they look at the quantity of gas sent out during the first 10 days of December, 1891, as compared with those of December, 1890, the diminished output awakens some regret. But when they think of the comparative calm they are now enjoying, and then of the hubbub of lighting up fresh furnaces, driving the boilers to get extra steam for thawing the lutes of gasholders, wrapping up exposed pipes, rapid changes of purifiers and preparation of material, choked mains and service pipes, 20 or 30 per cent. of the street lamps stopped up, etc., the regret is not unmingled with some satisfaction, for gas managers are as fond of an easy life as the rest of their fellow-creatures, although they do not often get it. And they are better able to cope with severe weather after the turn of the days, when the nervous tremors as to what the next few weeks may have in store have given way to an encouraging impression that we have got through the worst of it.

A paper on "Differential Rates"* has been read before the Manchester District Association of Gas Engineers, by Mr. Thos. Newbigging, and discussed at considerable length. Although speakers express their opinions in various ways, the general direction was towards the view expressed by Mr. Walton Clark at the recent meeting of the American Gas Light Association, to the effect that each consumer ought to pay an equal rate of interest on the investment necessary to serve him. A small consumer should pay more than a large one, because of the additional establishment charges, risk of bad debts, etc., involved in the collection of £100 in small accounts, as compared with taking it at one operation. And the inhabitants of a sparsely populated district situated three or four miles from the town, should pay the interest on the main pipe that brings their supply, the additional cost involved in sending out meter inspectors and collectors to them, the increased leakage, and so on, instead of leaving these expenses to be lumped into the general outlay of the concern. In some cases the supply of outlying districts has been obtained on the understanding that no increased charge is to be made, but gentlemen who find themselves under the necessity of carrying out such a bargain, appear fully alive to the fact that differential rates are the right thing, even if doubtful as to the policy of charging them.

The past week has been signalized by one of the most disastrous accidents in connection with coal gas supply that have ever occurred in this country. The casualties include five killed and ten more or less seriously injured, and, as is not unfrequent in the case of accidents with gas, the cause was gross ignorance, not to say recklessness. The scene was the market place at Blackburn, and the time 4 o'clock in the afternoon. As usual in the busy season with country towns, the sides of the market square are lined with substantial shops and buildings, and those in the block in question are about 50 feet high. At the time mentioned, a man rushed from the basement of one of the houses—the Crown Hotel—and incoherently warned the bystanders to get out of the way, shouting out that an explosion would occur, etc., apparently intending to go to the gas offices. Before he could get far, however, there was a report loud enough to be heard at a distance of three miles, together with a concussion that laid a frontage of 50 feet in ruins, comprising the hotel and the adjoining shop. The wrecked premises, of course, took fire, and then came the pitiable work of subduing the flames and rescuing the unfortunate occupants of the tenements, which included the proprietor of the hotel, his assistants and household, several customers, the proprietors of the shop, and a purchaser who had just entered. The facts, so far as they have as yet been brought to light, were these: In the basement of the hotel was a large meter connected to a 3-inch service, from which a pipe was taken across the market place for supplying the several stall holders. Recently these persons had decided that it would be a more satisfactory plan to each take an independent supply, and the arrangements for this had been carried out. The large meter, thus thrown out of use, was sold to a greengrocer named Robinson, who went on the Monday, in company with his brother, to

* See p. 915.

take it away. These men appear to have considered themselves equal to the task of disconnecting the meter, but after beginning to cut the pipes, found themselves unable to cope with the escaping gas, and ran away to get additional help, with the lamentable consequences above stated. They are now in custody on the charge of causing the death of the victims, and stand as a grim warning to all who are inclined to dabble with things that they do not understand, especially to amateur gasfitters and gas leakage detectors. It will be readily understood that the gas, escaping in large quantities, charged the basement with an explosive mixture of gas and air. This fired at the nearest flame, with a force sufficient to lift the floors and blow out the front wall.

It is rather a remarkable co-incidence, that two or three other gas explosions have been reported during the past week. Fortunately they have not been attended with loss of life, or indeed serious personal injury, though in one case the damage to property is rather extensive, nor do they possess any special features rendering them worthy of detailed notice here. Like the one above mentioned, they would all have been prevented by the exercise of a little forethought or common sense, but this our government system of education, notwithstanding its three or four languages and fashionable accomplishments, does not appear able to provide. A man who knows all about everything, and is prepared to act on that knowledge, is the most dangerous sort of fool going, and ought to be chained up as a common danger, like a mad dog. Of course, certain sections of our public press, ever on the lookout for something of the soul harrowing, marrow freezing, half-penny horrifying, shilling shocking, class of thing, have not failed to deal with the subject of the dangers of gas in a manner more remarkable for vivid imagination and sensation, than for knowledge of the subject and actual fact. But one does not expect otherwise from them, and the rarity of accident, looking at the large extent to which gas is applied in every town, is a fact that calls for no further support.

An account of the large gas burners manufactured by Messrs. Thomas Fletcher & Company is enough to make the manager of a gas works, in a country town, who is usually bothered with a considerable number of consumers whose accounts are reckoned by hundreds (of cubic feet, not of £ sterling) turn blue with envy. This firm, generally well known as having made a special study of gas consumption for technical purposes, has recently constructed a gas burner giving a flame 22 feet in length, and consuming the respectable quantity of 1,100 cubic feet per hour. It is used in connection with a chemical process, for bringing the gases contained in a tube 22 feet long by 3 feet in diameter to a regular temperature. But this is not Mr. Fletcher's leviathan, for he makes a burner capable of dealing with 3,000 cubic feet of gas per hour. This burner would run up a decent bill if the proprietor was to go away for a month's holiday and forget to turn it out before he went. The Warrington firm make no less than 200 varieties of special burners, ranging from a consumption of 40 cubic feet per hour upwards, and this fact seems to show that, with modern requirements of technical processes, there is a great future for gas in connection with applied chemistry, metallurgical operations, etc. The moral of this is that gas engineers must not rest satisfied with turning out gas at a price sufficient to satisfy ordinary lighting consumers, but continue their endeavor to reduce its cost to the lowest practicable point, so as to be able to meet a possible, indeed probable, demand for large quantities at cheap rates.

The town authorities at Leeds are also the owners of the gas works, and they are about to apply to Parliament for the authorization of a Consolidation and Improvement Bill. Amongst other things there are several clauses relating to the gas undertaking, and one of these is particularly worthy of notice. It gives the Corporation power, through a properly appointed officer, to inspect all gas pipes and fittings in new buildings before the same are plastered or covered over, 24 hours notice of the intention to cover up being given, and to prohibit the use of any arrangement, pipes, or fitting that would be likely to lead to waste, misuse, or undue consumption of gas. This clause was objected to by representatives of gas fitters and plumbers, and perhaps the fact that it was opposed is a strong argument in its favor. Although not quite consistent with some people's notions of British independence, so far as the right to prohibit the use of anything is concerned, there is no difficulty in showing the reasonableness of such a clause, and further, the necessity that exists for it. Suppose a small pipe or a bad burner to be fixed. If the person who supplied it got the credit, when the bad light or the high bill was complained of, all would be right so far as the supplier of gas is concerned. But I need not tell gas engineers that in 99 cases out of a 100, the blame is put upon the gas works. The suppliers are accused of sending out bad gas, of employing dishonest workmen, and so on. The enraged consumer does not scruple to put forth his own experience, as an awful example to intending users of gas. So the interest of the gas suppliers in the matter is not a mere creation of fancy, but real and tangible. As much being admitted, it is easy to show their right to protect that interest. The step that the Leeds town council are taking is in the right direction, but at the same time it must not be forgotten that it carries increased responsibility with it. If the suppliers exercise their right to prohibit, the consumer may retaliate by demanding instruction as to the proper appliance. If the company say "You must not use that," he may reply "Then what must I have?" So that the powers asked for would carry with them the necessity for proper showrooms, if not for being in a position to carry out gas fitting work if required. This, however, is only what should exist in any case, so it is to be hoped that the Leeds authorities will gain the powers they ask for, and that the precedent thus established will be followed by gas suppliers generally, companies as well as town authorities.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

A SPECIAL meeting of the stockholders of the Standard Gas Light Company of this city is called for 1:30 P. M., of January 31st, 1892, to be held at the office, No. 2 Courtlandt street. The purpose of the meeting is to pass upon a resolution to increase the number of Directors. The transfer books will close Saturday, January 16th, 1892, to be re-opened Friday, January 22d.

AT a meeting of the Cleveland Council Professor Avery offered an ordinance providing for the appointment of a Gas Inspector for the city, who if appointed shall make tests of the gas both as to composition and quality. Further, that he shall examine and test meters complained of by consumers, for which examination the consumer shall be obliged to pay 50 cents, provided the meter is found to be fast, otherwise the Gas Company will be called on to pay the fee. The salary of the Inspector is put at $1,000 per annum.

ON the morning of December 19th a fire occurred in a storeroom adjoining the purifying room of the Syracuse (N. Y.) gas works, but the prompt action of the employees prevented the flames from spreading. The damage amounted to $500, and there was no interruption to the ordinary manufacturing routine of the Company. The cause of the fire was spontaneous combustion.

JUDGE MCCLUNG, of Common Pleas Court, No. 3, Pittsburgh, Pa., recently gave an opinion in the case of the Borough of Edgworth against the Wilkinsburg (Pa.), Electric Light Company. Plaintiff alleged that it made a contract with the defendant Company to light the town by means of arc lights on a moontable schedule for a sum as low as that paid by any other consumer on the Company's lines. The Electric Company asserted that 25 cents per light per night was the minimum sum so paid, but it afterwards came out that the Company was lighting the adjoining Borough of Boughton for 18 cents per lamp per night. The Judge finds that plaintiff's assertion was proved by the testimony, wherefore he ordered the defendant to reduce its price for Edgworth to 18 cents.

THE Youngstown (O.) Gas Company recently lost about 100 barrels of fine coal gas tar through a fire, which in some unaccountable manner broke out in the tar tank.

ATTENTION is called to the new advertisements in this issue which ask for bids on the coal tar produced on the works of the Citizens Gas Company, of Buffalo, N. Y., and on the works of the Peoria, (Ills.) Gas Light and Coke Company. Superintendent Miller, of the first named Company, puts the probable tar output of the works under his charge at 150,000 gallons per annum, and asks for proposals to cover contract periods of one, three and five years. The Buffalo competition will close on January 20th. Superintendent Coffey, at Peoria, estimates that 2,000 barrels of tar will be produced on those works in the next twelvemonth, and his desire is that proposals shall be made for one year's product, and no bids will be received after January 31st next.

MR. A. G. Glasgow, formerly on the engineering staff of the United Gas Improvement Company, has been appointed to a prominent position in the service of the Standard Gas Light Company, of this city. We are somewhat at a loss to define whether Mr. Glasgow is to be designated as a General Manager, as an Assistant General Manager, or as Engineer-in-Chief of the Company—it is difficult in these days of shifting scenery up Pleasant avenue way to call anything by a name in a single 24 hours that will answer to the same appellation in the next 24. If Mr. Glasgow is to act as the Company's engineer the choice would

seem to be a wise one; for he has youth and grit and opinions—although these qualifications (especially the two named last) so far have not proved mainstays to those who have been called into the Company's service.

WE are indebted to a correspondent at Columbus, Ind., for the following interesting hints from that point respecting the operation of the municipal electric lighting plant: "At a recent meeting of the Council the following expense account report was submitted by the Electric Light Committee:

"Your committee desires to submit the following for the six months ending November 30, 1891:

"For month of June, lineman, $40; engineer, $63.93; coal, average per month, $75. July, oil, waste and lineman, $43.65; engineer, $60; coal, $75. August, oil and extra repairs, $31.37; lineman and engineer, $100; coal, $75; repairs on line, $30.37. September, extra labor on line, $32.85; lineman and engineer, $100; coal, $75. October, lineman and engineer, $100; coal, $75; supplies, oil, etc., $12.25. November, lineman, engineer and coal, $175; repair and extra labor, $7.81; 4,200 carbons, $105—or a total of $1,246.36. This does not include depreciation nor interest on investment. We have at present 69 lamps in operation, at an average cost per lamp of $18.06, or $3.02 per lamp per month. Your committee finds the lighting station in excellent condition, and engine and dynamos in good repair, and everything clean and bright. Mr. Everroad, the lineman, is trying hard to do his duty, but your committee finds he has an up-hill business, as the first 60 lamps are in very bad condition and about worn out. Your committee has been corresponding with the Westinghouse Company in regard to said lights, but have not been able to get matters adjusted satisfactorily. We are of the opinion that said Company should repair our lamps at their expense." [Signed by the committee.] "This report was received and placed on file, which action was followed by the presentation of the following from Councilman Stevens:

"'Be it resolved by the Common Council of the city of Columbus, that the electric lamps on the electric plant furnished by the Keystone Construction Company, authorized agents of the Westinghouse Electric Company, have worn out in 18 months' use, and as it is the opinion of this body that said lamps, if they were made of good material and properly constructed, should not be worn out;

"'That this Council demand of said Company that they repair said lamps or furnish good lamps in the place of those found to be worn out; said lamps to be furnished free of charge, except the cost of freight and putting them up. Also,

"'*Resolved*, That should the above Company refuse to make good the lamps which their representative acknowledges to be defective and constructed upon a bad principle, this Council hereby ask the Mayor to appoint a committee of three or more members, to be instructed to fully investigate this matter, and this committee be also authorized to correspond with other electrical companies for the purpose of trading the dynamos and lamps, etc., now in use for new ones, which will not become useless after 18 month's use: this Council believing that a system that causes an expenditure of $1,200 to $1,500 for new lamps in less than two years' use, and with no guaranty that if new lamps of same make are purchased and put up in place of those now worn out, the same amount will not have to be expended in another two years for another supply of lamps, is not the system to furnish cheap light for this city—the object aimed at in a city owning and maintaining its own plant. It is also

"'*Resolved*, That the Clerk furnish a copy of these resolutions to the Keystone Construction Company, or the Westinghouse Electric Company, or their successors.'

"Mr. Stevens then spoke in favor of adopting the resolutions, and his motion to that effect was seconded by Mr. Coats. The argument became general, and the only speaker in opposition was Mr. Miller, who defined his position by remarking that he, as Chairman of the Electric Light Committee, had instituted a correspondence with the Westinghouse Company, looking to the latter furnishing relief to the city: hence, he feared if the resolutions were adopted it would interfere with his proposed adjustment of the matter. The resolutions were adopted.—L. R. K."

AND here ends the first chapter of the management, by the authorities of Columbus, Ind., of a municipal arc lighting plant, which is, or was, often quoted as a sample of how cheap such management was. Cheap it is in every sense of the word, that is not its best sense. Taking the report of operating the plant for the six months, as submitted by the Columbus Electric Light Committee—a mountable schedule is followed—we find that if the itemized report of accounts is correct, the totals given of the monthly cost of each lamp are incorrect. The items foot up a total of $1,277.23 instead of $1,246.36, thus bringing the average per lamp for six months to $18.51 instead of $18.06, and to $3.09 per lamp per month instead of $3.02. Now, as no charge has been made for depreciation or wear and tear at any time in the not quite two years in which the plant has been operated, thus enabling the presentation of "catchy" cheap figures in the past, and as the real truth of the matter is that the 69 lamps are ready for the junk shop, we presume it will not be unjust to add the cost of replacing these (it is said they cannot be replaced for less than $1,500) to the cost of operating the plant, say for two years. We presume the charge of $3.09 per lamp per month is as small as it could possibly be made to appear; in any event, at that rate the cost per lamp per year would be $37.08, plus $10.87, or 50 per cent. of the cost of renewing 69 lamps at the end of two years, or $47.95. This is a pretty stiff charge for maintaining a public lighting service of arcs rated to develop, nominally, 1,200 candles, on a moontable service, especially when it is borne in mind that in this charge no allowance is made for depreciation, interest, rentals, the rebate due on account of exemption from taxes, and so on. Space has been given to this merely to call attention to the falsity of the figures that have been furnished more than once by the Columbus authorities, when they were appealed to by favorers of municipal lighting in other districts, when such favorers were collecting data in proof of their assertions that such lighting maintenance would result in great saving to their respective districts. Columbus returns have been made in instances of this nature purporting to show that the cost to Columbus of each arc was less than $25 per annum.

IN answer to "A. S. D.," of Memphis, Tenn., we would say that the offices of Mr. M. J. Drummond have been for some time back located in the Corbin Building, 192 Broadway, this city, as was noted in the JOURNAL shortly after Mr. Drummond's removal from the Equitable Building.

MR. JOHN HEARNE, formerly with the Equity Gas Works Construction Company, of New York, has accepted a position with the Roxbury Gas Company, of Boston.

THE Brooklyn *Citizen*, dated the 17th inst., said: "In the City Court to-day, before Judge Van Wyck, the suit of James Langan, to enjoin the Union Gas Light Company from consolidating with the Citizens Gas Light Company, was discontinued. Prior to this, however, another injunction was obtained in a representative stockholders' action, begun on newly discovered causes of action which could not be joined with the causes of action in the former suit. The first action was begun to compel the recognition of Mr. Langan's rights as a stockholder and to give time to investigate the merits of the proposed consolidation. The result is the discovery that seven-tenths of the Union stock is held by a Kentucky corporation, the Directors of which are also Directors of the Union, and, as the latter, have given themselves, as the former, a contract and received therefor $180,000 of the bonds of the Union. The claim in the present action is that the consolidation is proposed by these Directors to cover up their tracks."

THE works of the Kingston (Canada) Gas Company were badly damaged by a fire that occurred on the 16th inst. The damage is put at $8,000, but the Company is insured to the full value of its property.

MESSRS. J. H. MEAD, Charles Robson, P. B. Spence, D. B. Anderson and A. S. Berry are the incorporators of the Ohio Fuel Gas Company, which is organized under the general laws of the State of Kentucky. The general nature of the business in which the Company is to engage is "the buying and selling of patent rights for processes, machinery, and appliances for the production and use of heating and illuminating gases, either or both; * * * to sell, convey, and assign to others the right and privilege of making gas under or by any patented process of which said corporation may be the owner or proprietor; to erect, operate and maintain plants or establishments for the production of electric currents that may be applied to light, heat and power purposes; and to do and perform all acts incidental or necessary to the transaction of the general business above specified." The main place of business of the Company is at Newport, Ky., and a branch office is to be operated at Cincinnati, Ohio; but regular meetings or called meetings may be held in the latter place. The capital stock is put at $500,000, but a majority of the shareholders may at any meeting increase the stock to $1,000,000. The private property of the members, incorporators or stockholders shall not be liable for the Company's debts or liabilities. The corporation may, by vote of a majority of its stock, ratified by the consent of

the Directors, issue interest-bearing bonds. The life of the Company is put at 25 years.

MR. L. P. GEROULD has been appointed Superintendent of the Nantucket (Mass.) Gas Light Company. His office will be in the local auction house of Mr. A. M. Myrick. Mr. Gerould declares he will convince the steady-going residents of the old whaling port that gas as a means of cooking and heating will answer their needs both effectively and economically.

THE Northampton (Mass.) Gas Company will in January remove their offices to the Fearing Building.

THE new holder of the Charlestown (Mass.) Gas Company is completed. It is located in the district known as the "Neck," and has a capacity of 250,000 cubic feet.

THE proprietors of the Davenport (Ia.) Gas Company have filed a claim for $3,700 against the estate of Ross Woodmansee, formerly—in fact, up to the time of his death—the virtual controller of the property. The claim is based on the assertion that, as Treasurer of the Company, Mr. Woodmansee failed to turn into the funds a sum collected by him on gas accounts equal to that named.

AT a meeting of the stockholders of the Columbia (Pa.) Gas Company, the following officers were chosen: President, James A. Myers; Managers, H. M. North, H. F. Bruner, C. E. Graybill, Joseph H. Black, M. S. Shuman and Wm. B. Given.

SOME days ago a gang of men in the employ of the Newport (R. I.) Gas Light Company refused to work on the ground that the Company declined to discharge others of its employees who were not members of the local labor union. Manager Quinn never turned a hair, and the Company kept on supplying light to its consumers.

WE understand that the proprietors of the Stoughton (Mass.) Light, Heat and Power Company will overhaul their plant. The fact cannot be successfully denied that it would stand a revamping.

THE following awards for supplies of gas coal to the Philadelphia city gas works for the ensuing year were recently made:

Company.	Quantity, Tons.	Price per Ton.
Penn Gas Coal Co.	76,932	$3.48
Westmoreland Coal Co.	76,932	3.48
Montana Coal and Coke Co.	15,000	3.48
Newburg Orrel Coal and Coke Co.	15,000	3.49
Gaston & Despard Co.	15,000	3.49
Manor Coal Co.	5,000	3.97

Messrs. Jas. & William Wood, of Glasgow and New York, will furnish 6,000 tons of cannel (presumably Scotch), at $6.30 per ton.

THE American Gas Company has expended this season on its branch works at Elgin, Ills., the sum of $21,000. Four miles of steel mains were laid, and the capacity of the works proper has been increased by 33⅓ per cent. General Manager Ramsdell and Local Manager Fitz are softly smiling over the great increase in the Company's sendout in the twelvemonth now closing as against the sendout for 1890—reduced to conciseness the gain is equal to 40 per cent.

THE Capital City Gas Light Company, of Des Moines, Iowa, has instituted suit against the city to recover the sum of $5,000 for violation of contract.

THE continuation of the New Bedford (Mass.) gas hearing, before the Board of Gas and Electric Light Commissioners was brought off on the 19th inst.—for the evidence at the initial hearing see JOURNAL for last week, p. 889. The second hearing was even more largely attended than the first, and the closest attention possible was paid to the proceedings. Owing to the absence of Mr. A. B. Drake, who was to appear on behalf of the city, the hearing was began by an argument from Mr. Holmes, who spoke for the old New Bedford Company. Mr. Holmes having remarked that he did not propose to discuss the law points, said he would be able to show that all those interested in the proposed opposition Company had a grievance. The capital of the Company ($15,000) was too small to permit of the securing of any practical results, and all that it represented at present was the patented gas process of Gen. de Beauharnais. The Consumers Company asks to dig up 29,300 feet in the busiest streets, underneath the surfaces of which were gas mains, water conduits, sewers, and services, together with Edison wire conduits. It cost the New Bedford Gas Company $153,000 to lay its mains in 29 miles of streets, and the services cost $30,000. The Consumers Company would have to pay at least $30,000 for the pipes it asks to lay. Tests of the gas manufactured under Gen. de Beauharnais process, made under conditions satisfactory to him, showed that it cost more to manufacture this gas than that of the New Bedford Company. The latter has a capital of $750,000. It has a great number of stockholders, and pays a tax of $10,000, most of which goes into the City Treasury. In conclusion, Mr. Holmes argued there was no cause or reason for the building or operation of an opposition Company. President Stetson, of the New Bedford Gas and Edison Electric Lighting Company, said in the streets which the Consumers Company asks to dig up, his Company had mains sufficient to accommodate every house. In his experience the cost of laying gas mains in New Bedford was about $5,000 per mile, and care had to be taken that the mains were below the frost line. This Company was willing to purchase the Beauharnais patents, provided the gas thereunder was a merchantable article. N. W. Gifford, representing the New Bedford Company, and N. Hathaway, representing gentlemen interested in the Beauharnais process, investigated it jointly. They made the cost of the Beauharnais gas more than that manufactured by the New Bedford Company, and complications would arise in the manufacture under the Beauharnais process which would not give corresponding benefits. Of parties who complained about lights to the New Bedford Company none had to speak of the gas, but they did complain of electric lights. In the names of the incorporators of the Consumers Company none appear who, so far as witness knew, complained about the gas. The latter had been improved about 2½ candles, and now averaged at 19 candles. In response to a question by Mr. Desmond, President Stetson said the Consumers Company had such a plant as any individual would put in to satisfy any fad he might have. It would be impossible for the Consumers Company to lay pipes and be prepared to furnish gas to customers, such as is proposed, on a capital of $15,000. Having said that several of the parties named as capitalists in the Consumers Company had no particular financial standing, President Stetson, in reply to Mr. Butler, recited matters brought up at the hearing before the Board of Public Works, on the petition of the Consumers Gas Company, adding thereto that he knew nothing about the financial standing of J. B. Winslow, and all that he knew in that respect concerning J. M. Lawton, Jr., was that he kept a moderate size stationery and music store, in which a limited amount of electric light was used. President Stetson did not remember that it had been testified that the Consumers Gas Company owns the plant where gas, under Gen. Beauharnais' process, is manufactured. The amount of capital necessary to have things in shape to get gas to consumers by the Consumers Company would not be less than $100,000. The real estate would absorb $50,000. The water gas system at the New Bedford works had been in operation about six weeks, and it had improved the quality of the gas sent out. The price of gas in that time had not been reduced. The New Bedford Company had not failed to introduce improvements as fast as they were called for. Mr. Butler's question as to whether there had been complaints about electric lights and gas, brought out a rejoinder from Mr. Knowlton that, as the gas furnished by the New Bedford Company had not been complained of, that subject was not before the Commissioners. Mr. Desmond also gave it as his opinion that the question before the Board was a simple appeal from the decision of the Board of Public Works of New Bedford, denying petitioners the right to dig up the streets and lay pipes for gas. Before the question of electric lights could come before the Commissioners the Board of Public Works would have to pass upon a petition to stretch wires. Commissioner Barker, however, allowed the question, whereupon President Stetson said the New Bedford Company was liable to be called upon by a consumer at any time to know the state of his meter, and so on. There had been no formal complaints as to the quality or price of gas. As to electric lights, there have been complaints; not as to quality, but as to the price. Messrs. Briggs & Lawrence and Mr. Lawton, and others, who, under contracts before consolidation, were furnished electric lights at prices less than it could be manufactured without loss, have been active and vigorous complainants. Persons who were large and small consumers before the consolidation have, as a rule, continued to use the lights. In consideration of the number of the Company's services the complaints are not numerous. Suits have been commenced by the New Bedford Company against some consumers of gas to recover for gas consumed. To Mr. Barker, Mr. Stetson said the New Bedford Gas Company had an opportunity to purchase the Beauhernais process of manufacturing gas just before the report was made of the chemists who tested the process. At this point in the hearing a recess was ordered.

THE AMERICAN
GAS LIGHT JOURNAL

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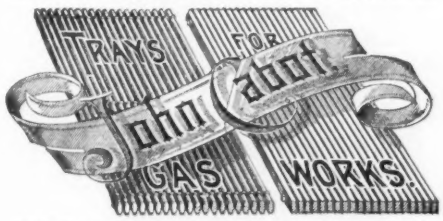

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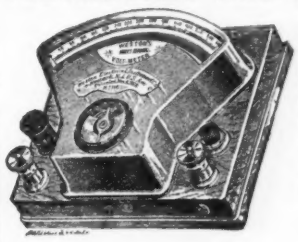

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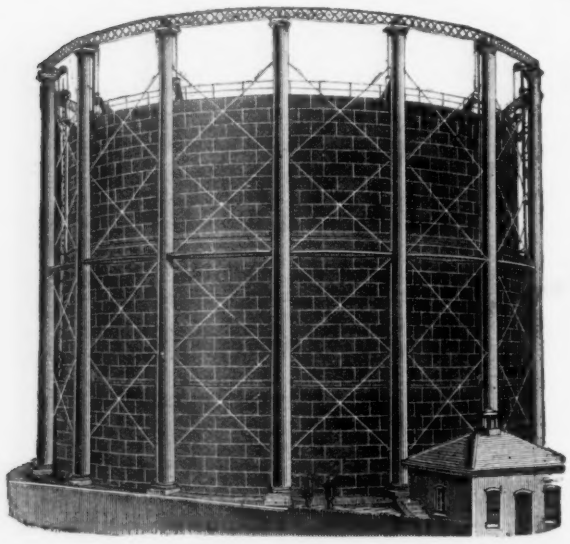

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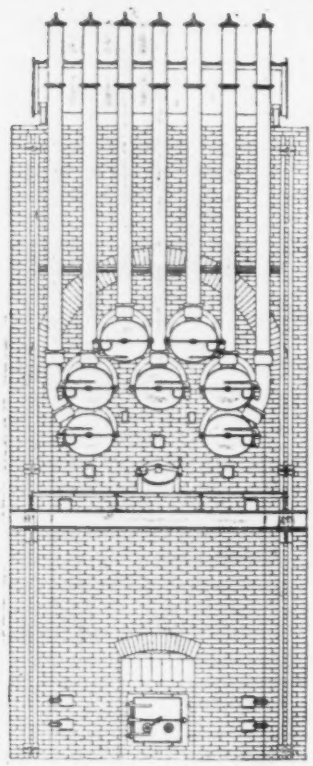

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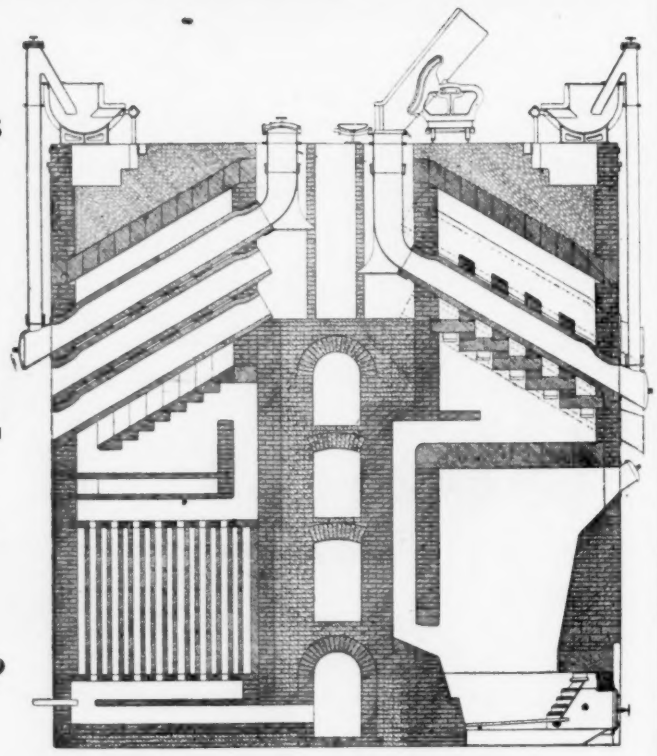

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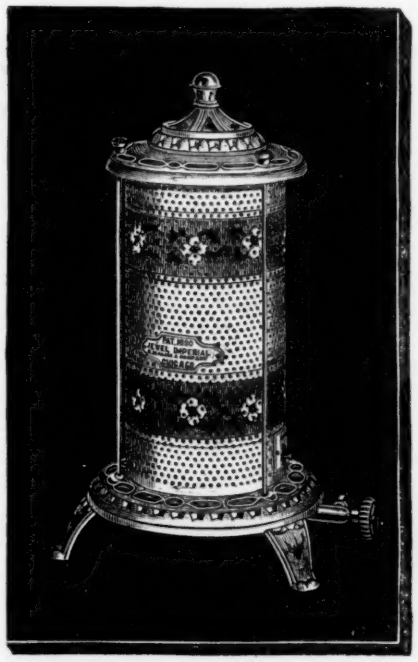

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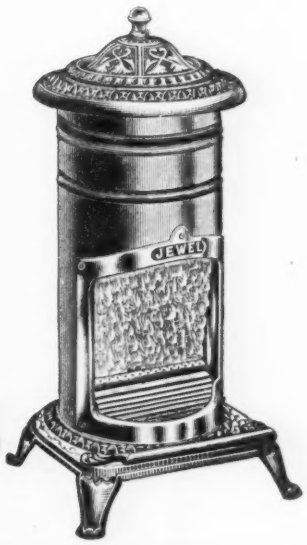

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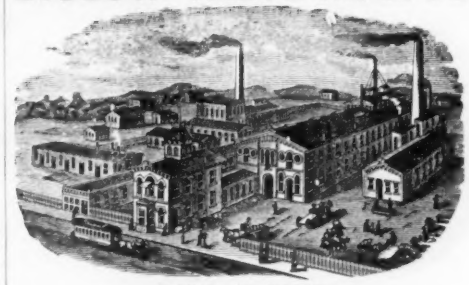

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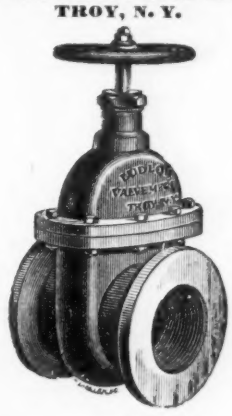

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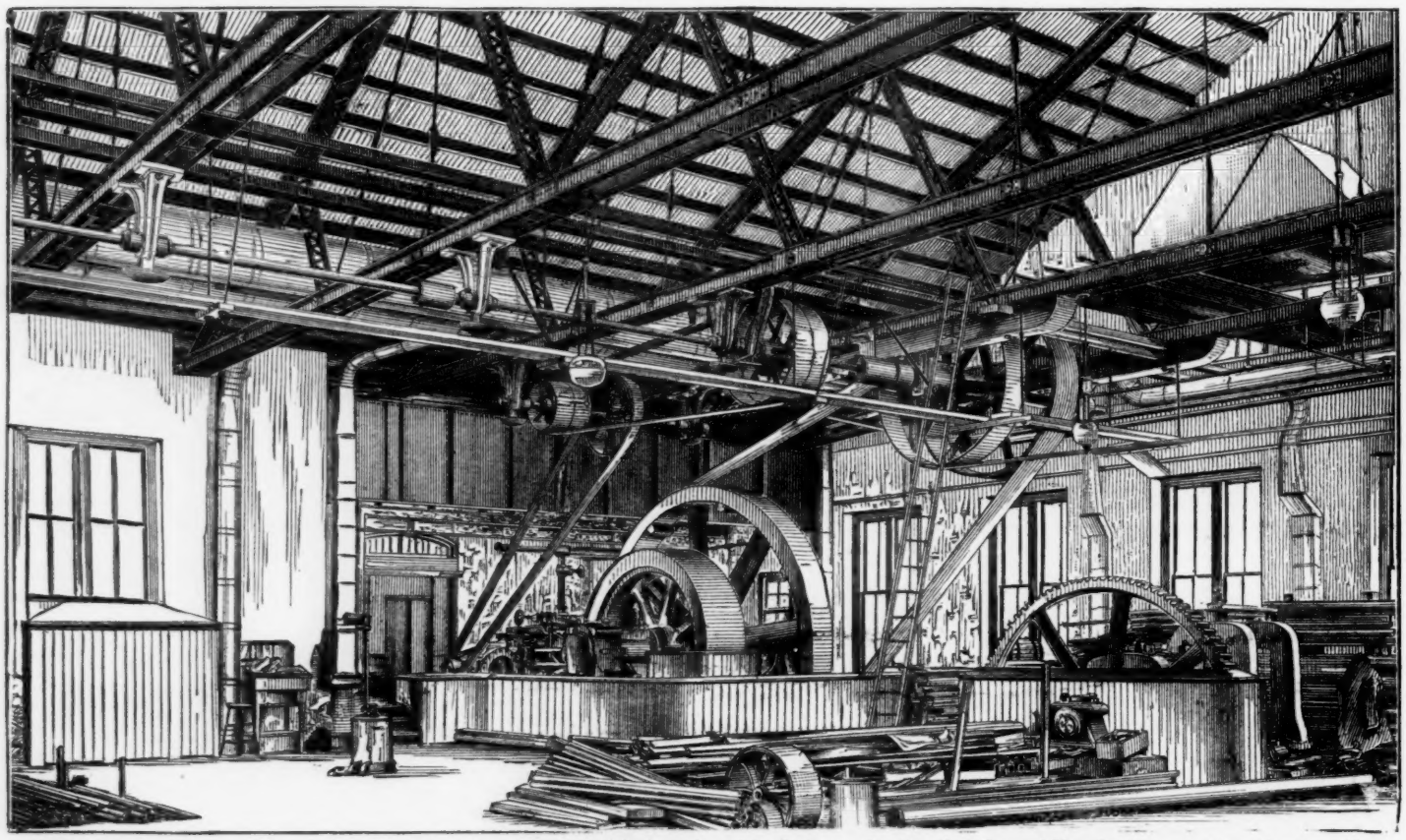

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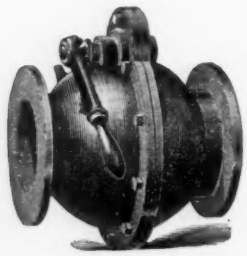

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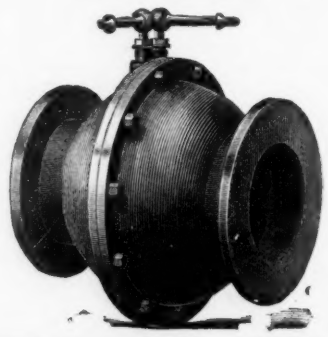

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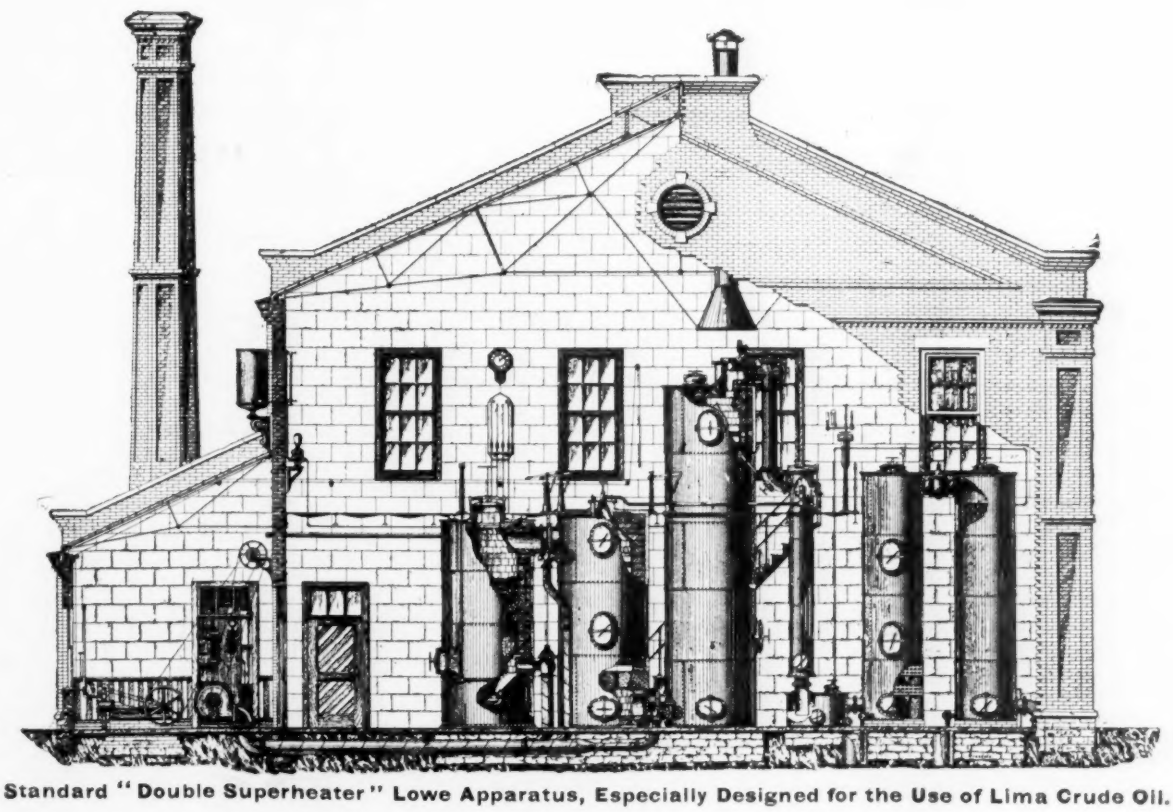

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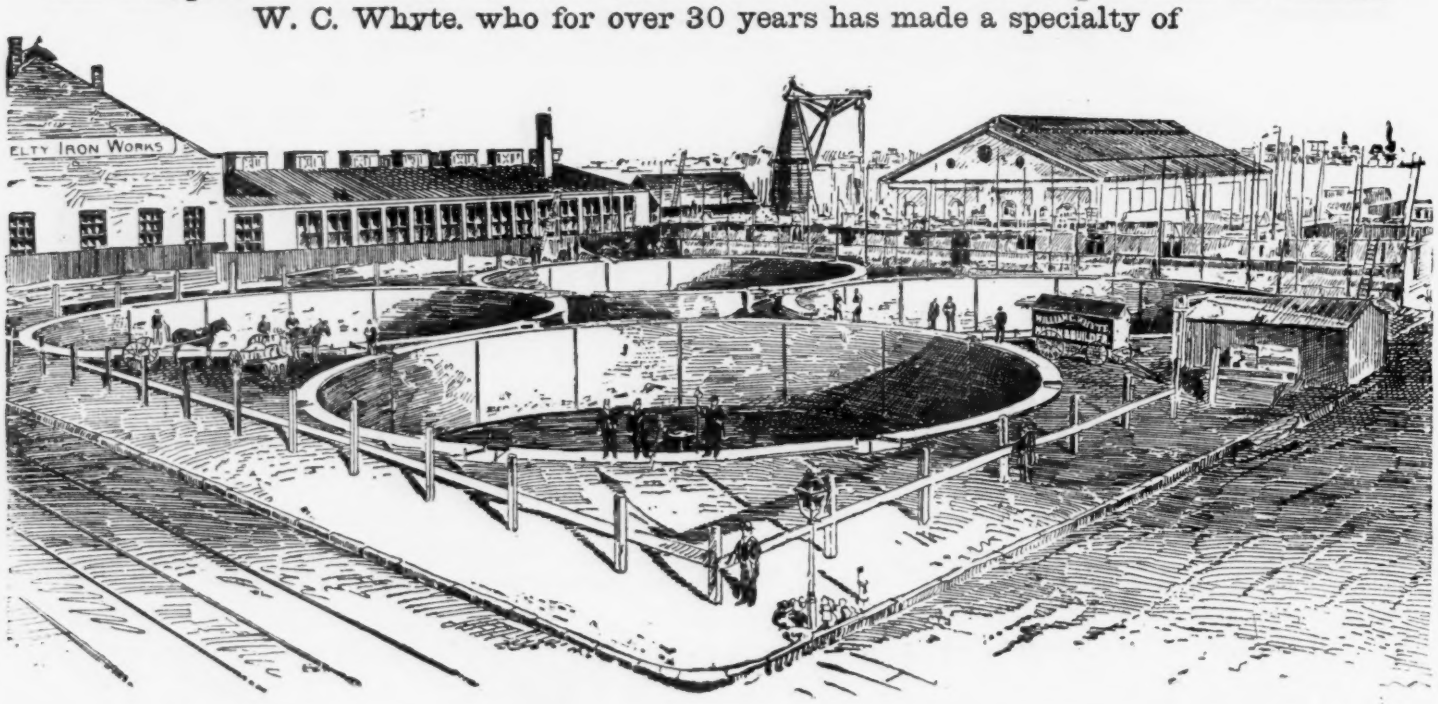

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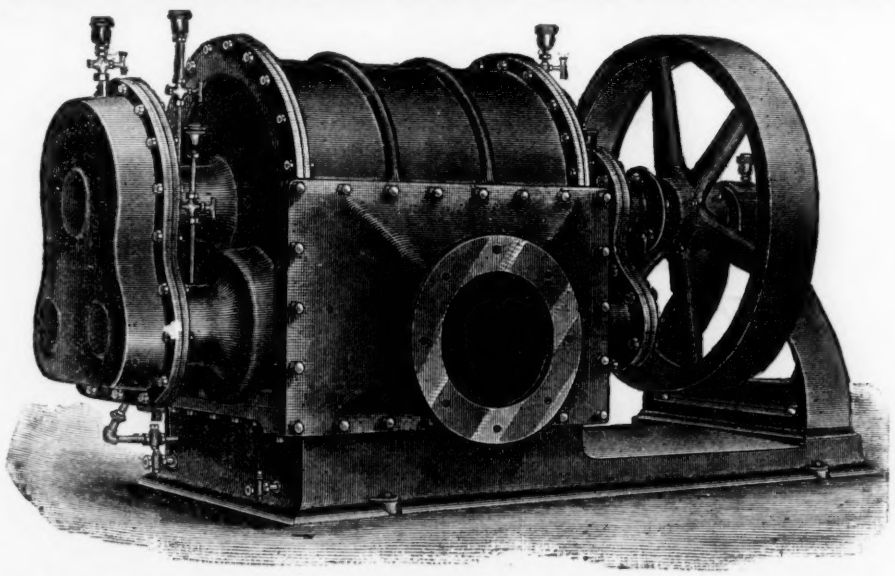

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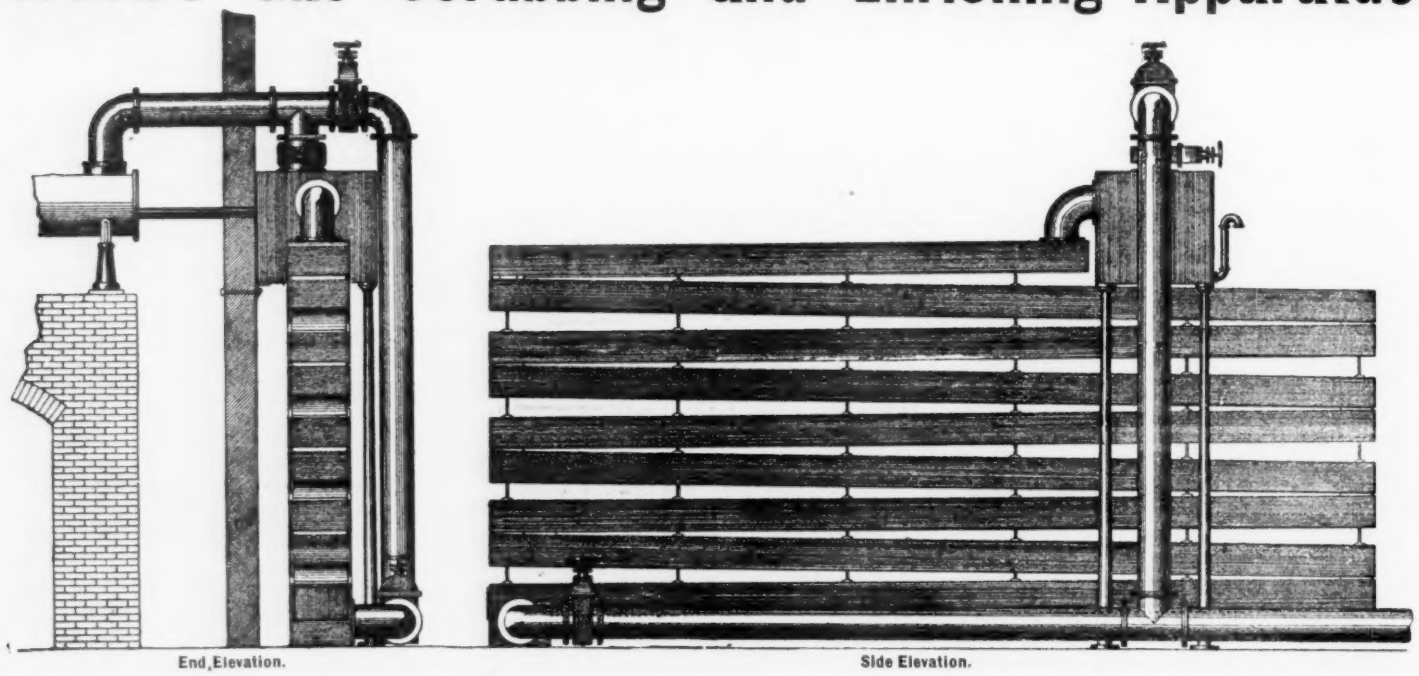

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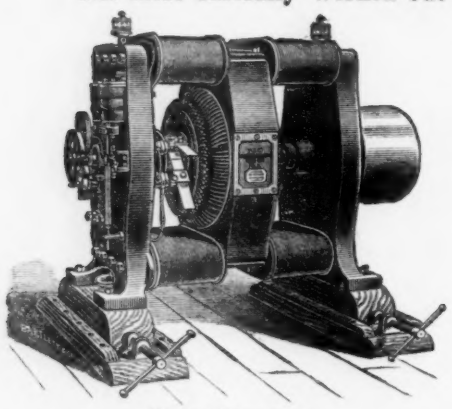

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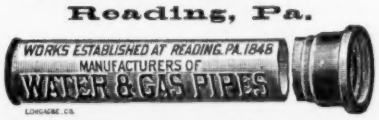

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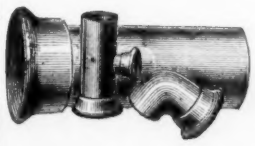

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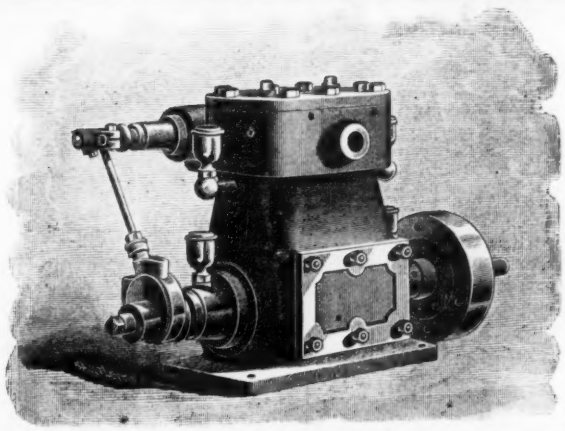

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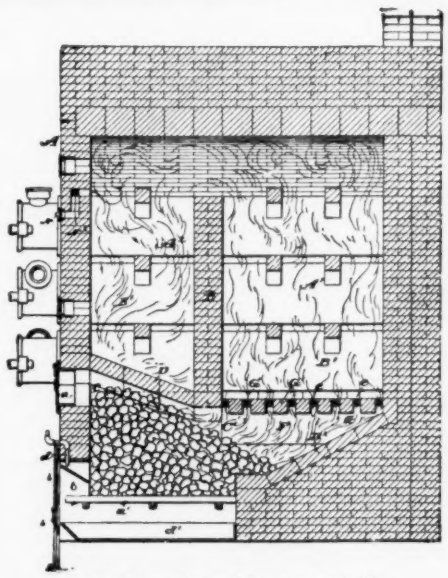

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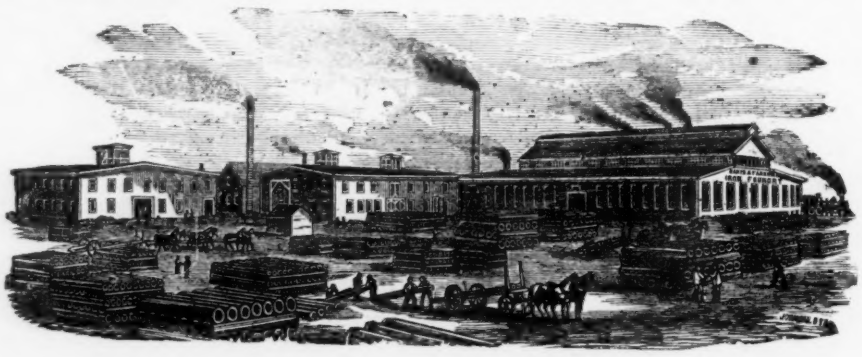

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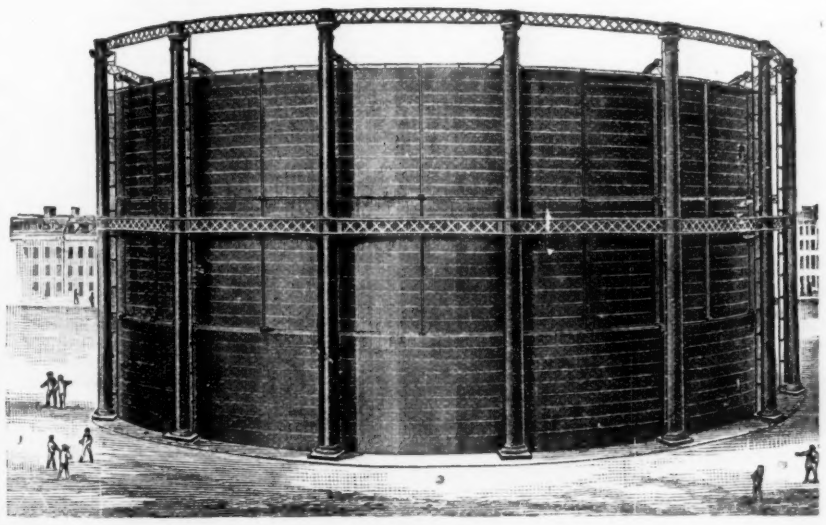

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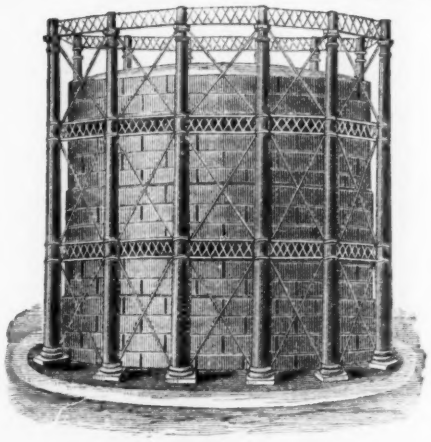

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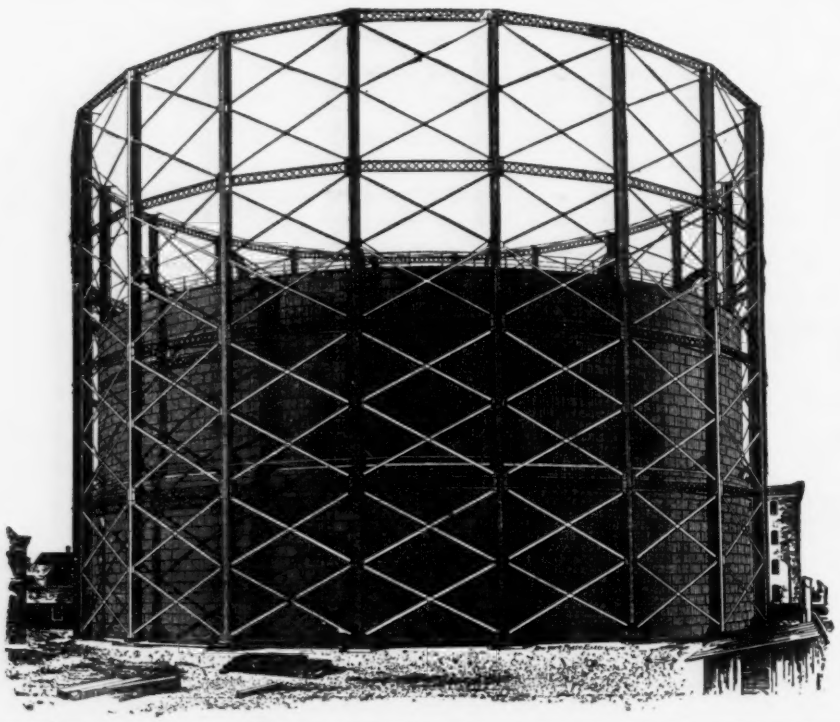

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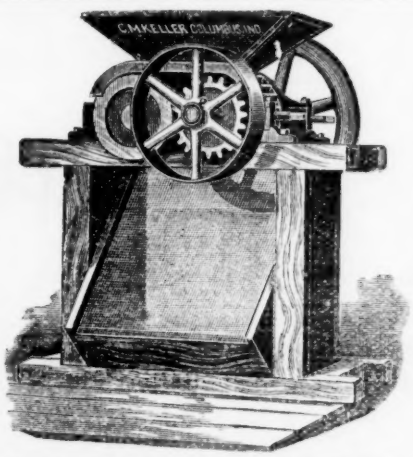

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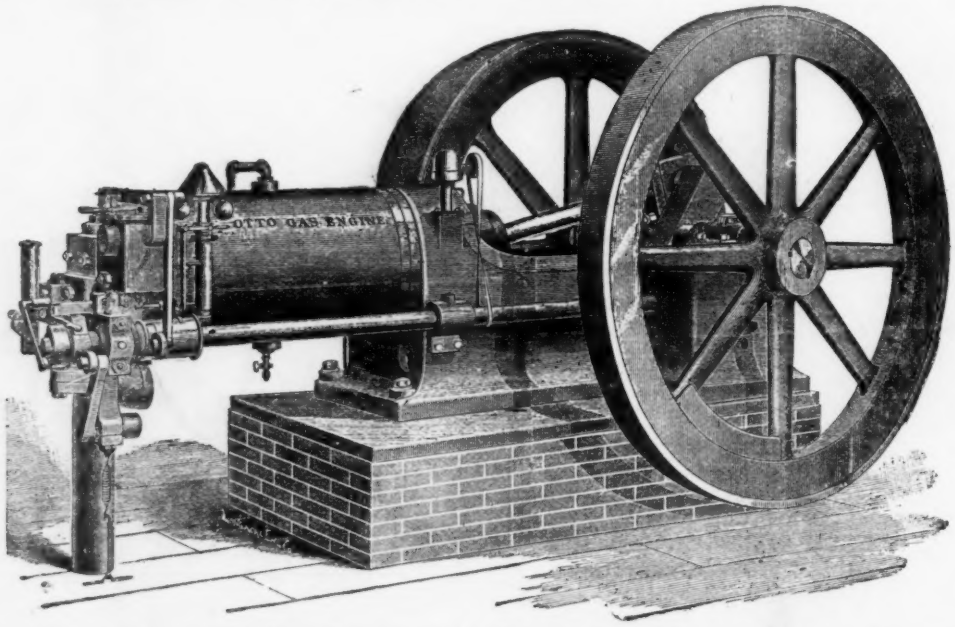

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